This is a digital copy of a book that was preserved for generations on library shelves before it was carefully scanned by Google as part of a project to make the world's books discoverable online.

It has survived long enough for the copyright to expire and the book to enter the public domain. A public domain book is one that was never subject to copyright or whose legal copyright term has expired. Whether a book is in the public domain may vary country to country. Public domain books are our gateways to the past, representing a wealth of history, culture and knowledge that's often difficult to discover.

Marks, notations and other marginalia present in the original volume will appear in this file - a reminder of this book's long journey from the publisher to a library and finally to you.

Usage guidelines

Google is proud to partner with libraries to digitize public domain materials and make them widely accessible. Public domain books belong to the public and we are merely their custodians. Nevertheless, this work is expensive, so in order to keep providing this resource, we have taken steps to prevent abuse by commercial parties, including placing technical restrictions on automated querying.

We also ask that you:

+ *Make non-commercial use of the files* We designed Google Book Search for use by individuals, and we request that you use these files for personal, non-commercial purposes.

+ *Refrain from automated querying* Do not send automated queries of any sort to Google's system: If you are conducting research on machine translation, optical character recognition or other areas where access to a large amount of text is helpful, please contact us. We encourage the use of public domain materials for these purposes and may be able to help.

+ *Maintain attribution* The Google "watermark" you see on each file is essential for informing people about this project and helping them find additional materials through Google Book Search. Please do not remove it.

+ *Keep it legal* Whatever your use, remember that you are responsible for ensuring that what you are doing is legal. Do not assume that just because we believe a book is in the public domain for users in the United States, that the work is also in the public domain for users in other countries. Whether a book is still in copyright varies from country to country, and we can't offer guidance on whether any specific use of any specific book is allowed. Please do not assume that a book's appearance in Google Book Search means it can be used in any manner anywhere in the world. Copyright infringement liability can be quite severe.

About Google Book Search

Google's mission is to organize the world's information and to make it universally accessible and useful. Google Book Search helps readers discover the world's books while helping authors and publishers reach new audiences. You can search through the full text of this book on the web at `http://books.google.com/`

600040467R

pt. 71

PATENTS FOR INVENTIONS.

ABRIDGMENTS

OF

Specifications

RELATING TO

MINING, QUARRYING, TUNNELLING, AND WELL-SINKING.

A.D. 1618–1866.

PRINTED BY ORDER OF THE COMMISSIONERS OF PATENTS.

BIBLIOTHECA BODLEIANA
45

LONDON:
PRINTED BY GEORGE E. EYRE AND WILLIAM SPOTTISWOODE,
PRINTERS TO THE QUEEN'S MOST EXCELLENT MAJESTY.
PUBLISHED AT THE
OFFICE OF THE COMMISSIONERS OF PATENTS FOR INVENTIONS,
25, SOUTHAMPTON BUILDINGS, HOLBORN
1874.

176. i. 45.

PREFACE.

THE Indexes to Patents are now so numerous and costly as to render their purchase inconvenient to a large number of inventors and others, to whom they have become indispensable.

To obviate this difficulty, short abstracts or abridgments of the Specifications of Patents under each head of invention have been prepared for publication separately, and so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. As these publications do not supersede the necessity for consulting the Specifications, the prices at which the printed copies of the latter are sold have been added.

The number of Specifications from the earliest period to the end of the year 1866 amounts to 50,222. A large proportion of the Specifications enrolled under the old law, previous to 1852, embrace several distinct inventions, and many of those filed under the new law of 1852 indicate various applications of the single invention to which the Patent is limited. Considering, therefore, the large number of inventions and applications of inventions to be separately dealt with, it cannot be doubted that several properly belonging to the group which forms the subject of this volume have been overlooked. In the progress of the whole work such omissions will, from time to time, become apparent, and be supplied in future editions.

PREFACE.

This volume contains Abridgments of Specifications to the end of the year 1866. From that date the Abridgments will be found in chronological order in the "Chronological "and Descriptive Index" (*see* List of Works at the end of this book). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place, the reader (by the aid of the Subject-matter Index for each year) can continue his examination of the Abridgments relating to the subject of his search in the Chronological and Descriptive Index.

This series of Abridgments includes the inventions relating to drawing and raising minerals and men from mines, and to mine bands, chains, and ropes; but pumping machinery, apart from special arrangements, is excluded, being already comprised in the series relating to "Hydraulics." Special modes of ventilating mines and tunnels are inserted, but not apparatus for exhausting or blowing, and which are applicable to various uses, including the ventilation of houses, ships, mines, &c. These last are abridged in the series relating to "Ventilation." Where, however, a particular invention is chiefly known through its widest application, in connexion with the subjects of the present series, the Specification has been abridged here. Similarly in a few cases, where the improvements, though not specifically claimed as applicable to mining, &c., are still obviously capable of being used for such purpose, the Abridgments of the Specifications have been inserted.

Methods of working mines and quarries and apparatus for the purpose are included, together with inventions relating to blasting, miners' fuses and cartridges, and explosive

INDEX OF NAMES.

[The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

Page
Abegg, F 279
Addenbrooke, G 166
Addison, J 130
Ahlstrom, O 101
Alison, A 247, 270
Allen, E. E 210
Allison, R 141, 149
Allman, F 89
Anderson, F. B 128
Ansell, G. F 259
Armitage, F. W 248
Askew, C ....(309 *App.*)
——, J ....(309 *App.*)
Austin, W 82, 206
Avril, V 140
Aydon, E. H 284
Aytoun, R 128, 134

Bailey, J 182
——, S 149
——, W. H 182
Baines, H..131,136,(308*App.*)
Bakewell, T. H 80, 100
Balmforth, W 233
Banks, R 16
Barber, J 9, 11
Barclay, A 83, 87, 205, 211
——, R 190
Barlow, P. W 249
Barnes, J. B 134
——, R. W 260, 268
Barsanti, E 125
Bartholomew, C 252, 274
Bartlett, T 96
Barton, J 217
Bates, G. A 111

Page
Baylis, C......(309 *App.*), 141
Bayliss, W....(306 *App.*), 109
Beacher, E 279
Beardslee, F. E. 209
——, *G. W* 209
Beart, R 46
Beaumont, E. B 119
——, F. E. B 247
——, J 13
Beck, E 76
Bedford, W. G 286
Bell, W. H 53
Bellford, A. E. L....80, 81, 86
Bellhouse, W 174, 283
Bennett, J 127
Bennets, W 147
Benton, M. F 207
Bernard, J 262, 268
Berrens, T 277
Bickford, J. S 50, 185
——, W 33
Biehler, G 166
Biram, B 41, 79
Bleckmann, J. H. A 282
Bodmer, J. G 44
Bohringer, G 145
Boissau, F 161
Booth, E 259
——, H 37
——, J. P 42
Bovill, G. H 53
Bowditch, W. R 231
Boycott, R 113
Boyd, R. H 258
Bragg, A 242
Brewer, S 266

Page
Bridgeman, G. W...........242
Broadbent, J. C..............268
Brooman, R. A....99, 115, 130, 170, 204, 248
Bruck, L. H.....................81
Bruff, P. S....................133
Brunel, M. I....................28
Brunton, J. D...............284
Buckley, W....................273
Buckingham, J...........38, 39
Budenburg, A.........224, 272
Budenburg, C. F.....224, 273
Budge, J.........................10
Bunting, E......................17
Burdon, W. W.........236, 249
Burleigh, C...................292
Burness, W...................152
Burrows, J........96, 115, 191
Burton, J. W.................215
———, R.......................172
Buttall, S..........................4
Buxton, W....................164

Callow, E........................64
———, J. T..................149
Cameron, R...............12, 14
Carbines, H....................47
Carlow, J. T..................194
Carrett, W. E................225
Casartelli, J. L..............123
Catelelineau and Chanoit, 138
Chabannes, J. F., Marquis de, 27
Chaffer, T.......................97
Chalmers, J..................178
Chanoit and Catelineau...138
Chanu, A. L....................67
Chapman, E. W..............23
————, W.........22, 23, 24
Chapusot, F.................140
Charlton, J......................19
Chowne, W. D................58
Clark, J. L....................119
——, R.......................208
——, W...............150, 286
Clarke, T.................52, 59
Clarkson, J.....................20

Page
Coats, G.......................103
Cochrane, Sir T..............31
Codde, L......................103
Coignet, F....................157
Colhoun, G. 160
Colladon, D..................120
Colson, M.....................219
Coltman, F...................201
Colwell, C....................174
Condict, N. W...............287
Congreve, Sir. W.............29
Cooke, W. F...........273, 275
Cope, W. W..................159
Copeland, G. A.............111
Copple, E. 184
Copple, J......................184
Corfield, W., jun............146
Cottam, S. F...................74
Cotter, J. B...................257
Cotterill, C. F...............285
Coulson, J......................95
Cowan, D.....................186
Cowper, C......................62
Cox, J..........................223
Coxon, S. B..................263
Crawhall, J.....................33
Crawshay, G.................165
Crease, E. S...........193, 225
Crestadoro, A...............200
Crossby, W.....................70
Crumpe, R........................1
Cunnack, R. J.........218, 236
Curr, J...........13, 16, 17, 25
Curtis, W. J..................101
Cutler, J..........(300 *App.*)

Daft, T. B.....................135
Dähne, F. W.................290
Dalby, S.......................279
Danchell, F. L. H..........244
Darlington, J.................293
Davey, S.... ....67, 95, 144
Davey, T.................50, 185
Davidge. J. D...............181
Davies, G.....................286
Davis J.........................168
Dees, J........................227
Delabarre, C. F...............94

Page
Delahaye, V. D..............211
Delmas, F..............127
Demanet, C. A. J..............137
Denton, W..............232
Deprez, J..............192
Destrem, H. A. B. R. J. M., 170
De Trets, A. E. C. J. R....152
De Wendel, C. A..............65
Dickinson, J..............169
Dietrich, C. F..............285
Dixon, E. J. J..............68
Dixon, J..............102
Dobb, T..............219
Dodman, G..............174
Dodson, A. J..............68
Dœring, F. B..........272, 289
Donisthorpe, G. E.........181, 189, 213, 227, 252, 270, 278, 281
Dougan, J..............191
Douglas, J. C..............34
Doull, A..............271
Dronke, E..............221, 240
Dudgeon, A..............210
Dudley, D..........(295 *App.*)
Dumas, A...............248
Du Motay, C. M. T..........44
Dunkin, R.............. 25
Dunn, S..............61
Durand, F..............199
Dutton, J..............151
Duverge, J. B. F..............171
Dyar, H. G..............32

Eaton, R..............116
Eckersley, T..............242
Edwards, G..............255
Elliot, G..............223, 263
Ellis, J..............97
Ellis, T., senior....(307 *App.*)
Emery, F. J..............104
Erhard, C..............138
Erhardt, L. H. G..............244
Esselens, P...............196
Evans, J. M..........212, 237
Evans, S. N..............152

Page
Farrar, J..............259
Farrell, W..............168
Farrimond, T..............194
Fehleisen, E...............282
Fehleisen, W...............282
Feichtinger, F..............247
Fidler, E..............282
Field, E..............284
Fieldhouse, J..............84
Firth, W., 188, 189, 218, 226, 241
Firth, S..........218, 225, 241
Folson, A..............123
Fontaine, —..............153
Fontainemoreau, P. A., le Comte de..............93, 122
Forster, G..............108
Forsyth, A. J..............23
Foulke, R..........(295 *App.*)
Fourdrinier, E. N..............56
Fourness, W..............38
Fowler, J., junior..............172
Franchot, C. L. F..............44
Francke, Sir L..............3
Fraser, J..............39
Freeman, M..............52
Freese, J..............2
Frizell, W..........(295 *App.*)
Fromont, P..............168

Gard, W. G..............57, 113
Garrett, W. E..............255
Garsed, E..............33
Gay, P. E..............217, 253
Gedge, W. E....153, 203, 265
Gibson, J..............223, 257
Gibson, R..............19
Gidlow, H..............139
Gilbart, F. H..............205
Gilbert, J..............1, 2
Gilbert, S..............161
Gilchrist, J..............206
Gillott, J..............279
Gisborne, F. N..............194
Gledhill, P..............254, 291
Glover, F. R. A..............98
Goble, G. F..............78
Gomez, E..............132

Page
Goode, J. ....(299 *App.*)
Goodman, G. B. 197
Gordon, R. 60
Grant, J. 46
Gray, J. M. 214
Green, D. J. 47
Green, J. 117
Greenley, D. 135
Greig, D. 172
Gresham, J. H. 289
Grier, W. W 258
Griffiths, J. 103
Griffiths, R. 53
Griffiths, W. T. 212
Guibal, T. 155, 195
Gullett, C 10, 11

Hackworth, J. W. 90, 109
Haggie, P. 254
Haines, J. ....(304 *App.*)
——, R. ....(304 *App.*)
Hampshire, J. K. 196
Hans, R. 101
Harrison, E. 272
——, J. J 272
——, T. 228, 229
——, W. C. 196
Harsleben, C. 31
Haseltine, G. 264, 292
Hateley, J. 15
Haupt, H. 260
Hawkes, W., junr. .(297 *App.*)
Hawkins. R. F. 26
Heaton, T. 105, 125
Hedley, O. D 69, 75
Hemming, F. S. 177
Hemingway, J. 184, 188
Henry, M 237
Heppell, G. 114, 122
Hewett, E. 182
Hey, J. G. 250
Higgins, J. 137
Higgins, T. 91
Higson, P. 49
Hodshon, R. 4
Hoga, S. 74
Holman, J 11
Hood, J. L. 36

Page
Horsey, Sir G. ......(295 *App.*)
Horton, J. ....(300 *App.*)
——, T. ....(301 *App.*)
Hoskings, H. 270
Howard, W. 129
Howden, R. 24
Howell, W. 29
Hughes, E. T. 156, 162
——, H. P. 128
——, R. H. 173
Hunter, G. 241, 273, 275
——, J. 169, 289

Jackson, J. 154
——, J. G. 137
——, W. 158
Jacob, J 185
Jacquet, J. N., ainé 239
——, *N. J* 94
James, C. R 287
James, E. W 229
Jeffreys, H. 18
Jenkins, W. 206
Johnson, B 202, 203
——, J. H. ..146, 199, 207, 260, 270
Johnston, W. O. 102, 182
Jolly, G. 228
Jones, C 288
——, G. 78, 88
——, J. G. 203, 216, 220, 235, 243, 252, 256, 261, 280
Jordan, T. B 293
Just, St. L. A. &c. B. de. ..158

Keightly, B. 131
Kellow, J. 200
Kingsley, J. 127
Kind, C. G 65
Klein, A. 264
Knowles, J. 156
——, J., jun. 50, 114
——, W. 11
Kraut, H. 82
Kolb, G 162

Lancaster, R. 148
Lauder, G. 258

Page
Lang, J. 238
Langlois, E. 207
Langworthy, R. 6
Law, J. 175
Leak, E. 237
Leatham, W. 262
Lebrun, N. J. 235
Lemielle, T. 89, 175
Lepetit, C. H. H. 164
Leschot, J. R. 204
Lever, E. 237
Levick, F. 84
Lewis, F. 166
Liebhaber, J. C. M., Baron 48, 65
Libotte, N. 150, 151
Lillie, Sir J. S. 170
Lindsley, T. 264
Lisbet, E. 191
Lister, J. 186
Loach, J. 134
Loam, M. 58
Lobb, J. 186
Locke, W. 225
Longbottom, A. 107
Longinoff, C von 155
Longridge, J. A. 110
Lord, J. 126
——, W. B. 205
Losh, W. .... (305 *App.*)
Loudon, J. 101
Low, G. 212, 265
——, W. 92
Lucas, E. .... (306 *App.*)
——, G. R. 77
Luis, J. 142, 164

McCarthy, J. J. A. 26
McEwan, J. 266
Mackenzie, J. T. 93
Mackworth, H. 121, 135
Maitland, P. 245
Mallet, R. T. 214
Marland, J. 139
Marlor, J. 86
Marsden, C. 99
Marshall, W. E. 225
Martin, R. 151

Page
Mather, C. 49, 92
—— ——, W. 49
Matteucci, F. 125
Meakin, G. F. L. 210
Meinzies, M. 7
Mellish, S. 20
Melville, A. 64
Mennons, M. A. F. 136
Messenger, H. J. 266
Miller, S. 21
Mills, W. 132
Milroy, J. 283
Mitchell, J. 224
Monckton, E. H. C. 199
Moore, B. 4
——, R. 197
Morris, T. 199
Morton, C. 3
——, R. 278
Motley, T. 59
Mudge, B. 266
Munro, J. 215
Murray, C. H. 268
——, J. 46
——, M. 20
Murtineddu & Co. 115
Myers, D. 186
——, H. .... (309 *App.*)

Neilson, W. 266
Neumeyer, G. A. 264, 293
Newall, R. S. .... (303 *App.*)
Newman, J. 147
Newton, A. V. ... 129, 170, 196, 223, 267
——, W. 6, 43
——, W. E. ... 45, 63, 70, 79, 85, 133, 160, 191, 209, 219, 239, 246, 251, 266, 269
Nisbet, J. 239, 281
Nixon, J. 188
Nobel, A. 223, 246
Norris, J. 269
Norton, J. 74, 84, 91

Opie, J. 154
Ommanney, F. F 290
Otway, E. W 121

Page
Owen, J........117, (310 *App.*)
Oxley, J........................8, 9
Palmer, C. R. N............. 104
———, T.......................51
Parker, J.......................276
Parkes, H. P...(300,305 *App.*)
Parsons, A.........................4
Paton, J.........................167
Paule, J. M....................125
Pautard, P......................171
Payerne, P. A..................44
Peace, W..................83, 87
Penneck, H.........(298 *App.*)
Penrice, H. N...106, 144, 181,
236, 274
Percy, W. C. S...........54, 134
Perkes, S..............70, 71, 76
Perkins, W..........................5
Perry, E. C....................173
Philippart, X................265
Phillips, T.....................151
Philippson, F. C.............143
Philipson, R. H..............227
Piaud, L.........................118
Pidding, W.................67, 77
Pirou, L. P. N. D.............60
Plevins, C. H.................204
Plimsoll, S.....................147
Polglase, J........179, 197, 223
Poole, J..........................177
Pope, J. B......................198
Pratt, T..............(301 *App.*)
Preisenhammer, C.........185
Puis, P. A..................57, 73
Punshon, J.............209, 283

Raley, W..........................18
Ramsey, D..........(295 *App.*)
Rave, N., senior............156
Read, J............................29
Reed, S............................35
Rees, G..........................193
Reichen, C......................267
Reid, W..........................119
Rennie, R...............126, 132
Rhodes, S. G..................215
Ribton, H. P...................178
Richards, S.....................279

Page
Richards, W. 76
Richardson, W.....(309 *App.*)
Ricker, S................207, 213
Rider, H..........................204
Ridley, R...142, 180, 188, 189,
203, 216, 220
Roberts, R.........................66
Robertson, J...........124, 140
Robinson, A......................33
Robson, F.......................233
Rock, J. B......................210
Rogers, A.......75, 85, 90, 244
———, E.........................97
———, J.........................145
Rollason, A.....................292
Rollinson, J....................172
—————, W................172
Roscow, T.......................126
Rostron, J.......................176
Rotheby, J......................180
Rothery, J.......................276
Rounsevell, W................197
Rouquayrol, B........171, 237
Routledge, W..................290
Royds, T.........................126
Russum, T. D......(308 *App.*)
Russell, J., junior...........240
Ruthven, J........................41
————, M. W...............41
Ryan, J.............................21
Rydill, G................183, 200

Sachs, C........................272
St. Just, L. A. de B. de...158
Sanderson, C..................207
Savory, P. H...................184
———, W.......................184
Schäffer, B. A.........224, 272
Schrader, C. A................140
Schwartzkorf, L..............143
Schultze, E..............221, 240
Scott, E..........................155
——, J.............................20
——, J. P.......................155
——, R..........................215
——, T..........................280
Scriven, G. R..................138
Scruton, W.....................215

Page
Seanor, S. E....215
Searby, G....177
Serrin, V. L. M.....150
Sharp, J....282
Shaw, J....247, 251
Shorland, W....(295 *App.*)
Short, H....200
Shorter, E....25
Simpson, E....113
——, G....63
Slade, J. T....34, (306 *App.*)
Sladen, W....(296 *App.*)
Sloper, J....293
Smith, A....36, 91, 93
——, C. C....107
——, G....50, 55, 185
——, J....(297 *App.*)
——, R....282
——, T....(301 *App.*)
——, W....94
——, W. H....(304 *App.*)
Sommeiller, G....146
Snowden, W. F....30
Spence, W....213
Spencer, G....178
Spill, D....156
——, G....156
Spurgin, J....36, 37
Standly, H. J....196
Stevenson, J....277
Stokoe, T....6, 10
Stone, S. M.....170
Storey, J....12
Struvè, W. P....52, 54
Sturgeon, J....221, 226, 230, 255
Suggett, J.....270
Sunderland, T....43
Sutherland, E....253
——, H....253
——, R. S....220
Sutton, S....5

Tarte, X....167
Tatham, W....20
Tayler, J. N....(304 *App.*)
Taylor, C. H....255
——, E. H....203

Page
Taylor, J....54, 55
Taylorson, T....250
Telford, J....225
Thomas, D....290
Thomson, R. W....243
Thorley, J....154
Timmins, J....160
Tolhausen, A....101
Tongue, J. G....287
Toovey, W....167
Trautmann, M.....130
Travis, E....123
Treeby, T. W. G....116, 190
Tregay, W....243
Trets, A. E. C. J. R De...152
Trouillett, A....203
Tuck, J. H....56

Valauri, J. B.....170
Vacherdt, A....108
Vandicke, M....3
Van Hengel, J. H....111
Varley. J....52
Vasserot, C. F....145
Vaughan, C....115
——, R....115
——, W. J....115
Victor, J....179, 197
Vigars, J....105
Vivyan, H....2
Von Longinoff, C.....155

Wadsworth, J....105, 112
Waithman, R. W...(307 *App.*)
Walker, R....98, 162
Walkinshaw, J....8
Walmsley, D....176
Walton, T. H.....251
Wardwell, G. J.....267
Waring, C. H....72
Warrick, J....(303 *App.*)
Warrington, J....225, 255
Washoe Tool Company...269
Weale, S....3
Weare, R....199
Webb, J....166
Webster, J....251
Weight, S....78

Page
Welter, M.....................145
Wemis, J. jun...................3
Weniger, C.....................185
West, C........................258
Westhead, M. B........136, 177
Westmacott, P. G. B........245
Whitaker, J....................232
White, T. R.....................286
White, W........................14
Whitehorn, W. R...........289
Wickens, H....................194
Widdall, J......................139
Wigfall, W.....................228
Wilcock, J........................56
Williams, G....................286
Williams, John,....(299 *App.*)
———, Joseph 3
———, J. G...............174

Page
Williams, W...................164
Wilson, J.......................148
Wood, W....................30, 32
Woodcock, A. B................50
Woodward. A..................134
Worthington, J..................89
Wright, A......................112
———, H.......................180
———, James.............177
———, John........(302 *App.*)
———, Joseph...............155
———, T.......................180
———, Z.......................163
Wynants, F...................196

Yates, G.......................219
Yule, J...........................88

MINING, QUARRYING, TUNNELLING, AND WELL-SINKING.

MINING, QUARRYING, TUNNELLING, AND WELL-SINKING.

A.D. 1618, January 9.—N° 8.

CRUMPE, Robert.—“C̃teine new way and meanes for the “drayning and drawing of waters outte of mynes, colepittꝭ, “and other mynerallꝭ, and for the raysing of waters farre “above the vsuall height for the svice of townes, castles, and “howses where the same is wanting and shalbe desired, with “much lesse charge & with more facilitie and ease than here- “tofore hath beene knowne and practized by any others.”

The inventor makes use of “a c̃teine hollow trunk or pipe “of one entire length, to be made of tymber or leade, which “is to reach from the waters that are to be drawne or raysed “vnto the toppe or place where the same waters shalbe to “vent or yssue forth, att the foote of which said trunck or pipe “so made of entyre length as aforesaid, & in some other “partꝭ or places thereof, there are to be placed & fyxed c̃teine “suckers, drawers, and other devises, and other engins of “brasse, copper, or other mettal, and att the opper part or “end of the said trunck or pipe there are to be planted and “placed severall pieces of tymber fyxed and framed together, “wherein are likewise to be placed c̃teine suckers, drawers, “and other devises, together with one or more wheele or “wheeles with spindellꝭ or crankꝭ of yron or brasse, whereby “the water shall & may be drawne or raised from any depth “whatsoever by the labour of one or two men without the vse “of horses to force or raise the same.

Grant for twenty-one years in consideration of a yearly payment of ten pounds.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1618, July 16.—N° 9.

GILBERT, John.—An “engine or instrument for the raysing “of waters in a greater quantitie, and to a greater height than

" heretofore hath bin knowne or practised in these our realmes,
" which said engine for raysing of waters is to be moued and
" driven either by some current or streame of water, or for
" want thereof by strength of horses, and is verie necessarye
" for the drawing and drayning of coale pitts and other
" mynes."

Patent granted for twenty-one years at a yearly rent of six pounds, thirteen & eightpence, but on the 7th November in " the fifth year of the reign of King Charles," that is to say, in 1629, the above-named patentee surrendered all his rights under the Letters Patent, which were accordingly cancelled.

[Letters Patent printed, 4*d.* No Specification enrolled.]

A.D. 1631, July 8.—N° 55.

GILBERT, JOHN, and FREESE, JAMES.—Draining mines. The subject matter of this invention is the same as that for which Letters Patent were granted to John Gilbert in A.D. 1618, No. 9. These Letters Patent were surrendered as stated in the abridgment given above. The present Letters Patent recite that they were surrendered for the purpose of procuring a fresh grant to John Gilbert and his nominee James Freese. The new grant is expressed to be for twenty-one years at a yearly rent of six pounds, thirteen and four pence.

[Letters Patent printed, 4*d.* No Specification enrolled.]

A.D. 1634, January 14.—N° 67.

VIVYAN, HANNYBALL.—" An engine of great vse and ꝓfitt,
" both to vs and our subjectꝭ whereby one man alone can
" easily drawe as much water as otherwise fower, and allsoe
" hoyse all weighty thingꝭ out of the said tynn woorkes."

This invention is expressed to have been designed for use in the Cornish tin mines, of which many were said to be unwrought
" for the greate chardges they are put vnto in draweing of
" waters, whereof some amounte vnto above three partꝭ in
" fower, and some to five partꝭ in sixe of the full value of the
" tyne gotten there."

Letters Patent granted for fourteen years at a yearly rent of three pounds.

[Letters Patent printed, 4*d.* No Specification enrolled.]

A.D. 1635, July 14.—N° 84.

VANDICKE, Mathewe, and FRANCKE, Sir Leventhorpe. —Draining coal, lead, tin and other mines, and "rayseing of "water to any height through pipes by windeing of counter-"ballance to the same."

Grant for fourteen years, a royalty of one-fourth of profits to be paid to the Crown.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1662, March 24.—N° 136.

WEMIS, James, and WEMIS, James, jun. — "A way "whereby all motions caused by the force of a river, winde or "horses may be done by the strength of one or twoe men, as "the makeing of all sorts of mills, and lifting of waights out "of mines and colepitts, and draineinge of them, and alsoe "the draineinge of such lands as are oppressed with water, by "an engine, the strength thereof may be dobled or trebled at "pleasure."

Grant for fourteen years.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1692, January 22.—N° 288.

MORTON, Charles, and WEALE, Samuell.—"A new ma-"chine or engine vsefull for beating, pounding, or stamping "all sorts of minerall oares, and hemp, and flax, and may "alsoe be applied to many other things that require pounding, "beating, or stamping; and if disioyned, part thereof may be "vsefully applyed for the raiseing or drawing vp of oar worke "and other things out of mines and coale pitts."

Grant for fourteen years.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1692, December 2.—N° 306.

WILLIAMS, Joseph.—"A new engine, consisting of screws, "wheeles, and wrenches, whereby" the inventor "is able to "draw and raise great weights, with much more ease and "advantage then by any other wayes or meanes now practised, "and will be of great vse in raysing mineralls," &c.

Grant for fourteen years.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1696, March 6.—N° 349.

BUTTALL, SAMUEL.—"A new way of raiseing and discharg-"ing waters out of mines, meers, ponds, or vessells by pipes "and other instruments and meanes exercised and vsed in a "quite different manner from any engine or thing whatsoever "for like purposes yet in practice."

Patent rights granted for fourteen years.

[Letters Patent printed, 4*d*. No Drawings.]

A.D. 1728, May 21.—N° 498.

MOORE, BRYAN.—"A new sort of engine or machine for the "boreing of stone, either free stone or greit stone, either strait, "square, or circulcular, for pipes, pumps, or other vses quite "different from anything hitherto practised for the like vses."

The Letters Patent recite "that the peticoner can with the "said engine bore any such stone from three foot to six foot "in length, and from an inch & a halfe wide to fourteen inches "as cheap as wood; that it will be of great service both in "town and country for the conveying of water wherever lead "or wood is made use of; that when the stone pipes are once "laid they will last five times as long as wood ones, and the "peticoner can fix new stone pipes to old wood ones."

Patent granted for 14 years.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1728, June 7.—N° 499.

HODSHON, READ.—"A new way or method of making corf "bows of iron, with springs thereunto belonging," as substitutes for the young trees then usually employed for this purpose.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1734, October 8.—N° 547.

PARSONS, ANTHONY.—Raising water, ore, coal, &c. out of mines, and supplying water to houses, &c.

The patentee declares the invention to consist "in manner "following (to wit) :—The first and cheif movement is a large "water wheel made entirely buckets & all without wood."

" The second power is that of men, which is done by crank
" handles fixed on the same axis as the water wheel runs on.
" The third is by horse or horses fixed to the end of a long
" beam, which lyes across a large wheell with teeth of brass
" or iron screwed to the outer edge, which communicates
" motion by brass or iron wheells to the water wheell. The
" fourth is wind," which acts on sails. The "water wheell
" by brass or iron movements, communicates motion to three
" large beams of wood, like unto those of the fire engine,
" which are moved from the center upwards; from each end
" of these beams goes rods of deal to the bottom of the pitt
" or mine, and forces the water up through two pipes of lead
" to the height of one hundred and fifty to two hundred yards.
" The fifth is for drawing up" minerals with horse power "by
" a rim of wood fixed on the before-mentioned horse wheell"
round which rim the rope is lapped. "The sixth is for drawing
" up" minerals by the same engine "by a large fly and
" pinion which works in brass or iron teeth of a large wheell,
" which has a rim of wood like the above-mentioned horse
" wheell." "The seventh is for clearing of mines and pitts of
" damps, by three large new invented bellows that are worked
" by the same engine, and carries a great quantity of air in a
" continual blast through a pipe of lead to the further end of
" the mine."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 155.]

A.D. 1744, March 16.—N° 602.

SUTTON, Samuel.— "A new invention or method for extracting
" foul air out of ships, and will equally contribute to
" the removing of all noxious air whatsoever, and may be conveniently
" applied to mines and caverns in the earth, dungeons,
" prisons, and all infected places."

Grant for fourteen years.

[Letters Patent printed, 4*d*. No Specification enrolled.]

A.D. 1744, September 6.—N° 609.

PERKINS, William.—Winding minerals.

Part of this invention, which also relates to the supplying of water to cities, &c., has reference to a mode of raising weights from pits, &c. For this purpose wind power is used. The windmill is horizontal, each sail being constructed in the following manner:—An outside frame is securely keyed to the shaft. Within it swings on gudgeons another frame carrying the sail. "When this sail meets the wind, as there is more " surface above the axletree than below it, it turns on the " gudgeons" till" its edge "comes formost," and "so causes " little resistance; but as soon as it is past the point of the " wind it turns again to a perpendicular, and is kept in that " situation" by a rope and weighted lever. "A small frame " with cloth" is also fixed "horizontally round the top and " bottom of the outside frame, to confine the wind to the " sail." There must be two sets of levers and weights to enable the mill to be reversed.

[Printed, 4*d.* No Drawings. See Rolls Chapel Reports, 6th Report, p. 156.]

A.D. 1749, May 9.—N° 643.

LANGWORTHY, Richard.—Windmill for hoisting minerals, &c.

A number of vanes or sails radiate from a central vertical shaft. A screen half encloses these sails, and only leaves the remaining part of them exposed to the wind's force. Vanes or sails are also attached to the case, by means of which it is kept in proper position, and for this purpose it rotates on wheels or friction rollers round the central shaft and sails. Suitable gearing, according to circumstances, is to be provided to communicate the power to the winding drum or pumping apparatus.

[Printed, 6*d.* Drawing. See Rolls Chapel Reports, 6th Report, p. 123.]

A.D. 1749, July 29.—N° 648.

STOKOE, Thomas, and NEWTON, William.—Winding minerals, water, &c.

For this purpose the patentees make use of a large drum, round which works an endless hoisting rope, and which is rotated by the movement of horses, oxen, or men within its periphery. The animals are moreover yoked "at a proper " distance to a fixed prop or post, and drawing thereat their " feet will forcibly concur with the action of their weight, "and both *together* give great power to the circumvolution of "the wheel."

[Printed, 4*d*. No Drawings.]

A.D. 1750, February 9.—N° 653.

MEINZIES, Michael.—Winding coals, water, &c.

In order to carry the coals or minerals from the spot where they are dug to the bottom of the shaft, the patentee proposes to lay a double waggon way along the working, which dips towards the shaft, and an endless rope, or two such ropes working one above the other, passing round pulleys at the shaft and the heading. To these ropes the boxes are attached, each box being provided with four wheels. The weight of the filled boxes takes them down the incline, and at the same time brings up the empties. When it is desired to bring the boxes up an incline to the shaft from a lower level in the pit, counterbalances may be used in the shape of trucks or vessels filled with water. For raising the minerals to the pit mouth counterbalances of water are also employed, worked in various ways as described by the inventor. Water is also to be raised from mines by similar means. This apparatus also includes the use of a communicating wire from top to bottom of the shaft, so that the bankman at the top shall know "(without their roar-"ing from below as usual)" that all is ready below.

The invention further comprises means of running the minerals and rubbish from the bank to the staithes or waste heaps as the case may be.

[Printed 10*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 124; extended by Act of Parliament for 14 years.]

A.D. 1761, May 20.—N° 762.

MEINZIES, Michael.—Working and draining mines.

The first part of this invention has relation to a method of hewing and cutting coal, &c. mechanically. The apparatus, which consists of a pick, the handle of which may be lengthened as the cut deepens, is worked by means of two spears from the engine above ground. These spears move horizontal spears or rods in the mine, and finally the apparatus itself. If preferred, one spear only may be used, the pick being withdrawn by hand, or again, the spears may be dispensed with, and the pick worked by manual power in various ways. One way is to mount the pick on an axis having "broad spokes" projecting from it, upon which spokes a man suddenly applies his weight to impel the pick. To drive in the wedges for bringing down the coal a hammer may be substituted for the pick. It may be mentioned that the apparatus will work vertically as well as horizontally. Modifications are also described for working boring tools and saws, and in one case annular saws are described for sinking shafts. Spears shod with iron, and apparatus similar to pile drivers for crushing hard rocks are also described for the same purpose. For driving horizontal borings a method of working the drill by passing it through the axis of a wheel worked by water power is indicated. When the drill becomes long and heavy it is supported in the boring by little friction globes of metal sunk into the tool.

Methods of draining workings by means of syphons and vacuums are also described.

[Printed, 10*d*. No Drawing. See Rolls Chapel Reports, 6th Report, p. 131.]

A.D. 1762, May 21.—N° 775.

WALKINSHAW, John.—Hewing coal, &c.

The inventor calls his apparatus "a sort of catapult." A large hammer has its shaft inserted in a cable composed of a great number of small cords twisted together by wheels at each end. The hammer is raised by a windlass, the twisting of the cable increasing the while, so that when the forceps holding the hammer head are opened, the hammer falls with great force on a number of chisels or wedges set in rows.

"When this engine is employed to the raising of water, the " power of it is applied to raise pump rods, &c."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 132.]

A.D. 1763, July 29.—N° 795.

OXLEY, Joseph.—Winding machinery.

The spear attached to the beam of the steam engine is provided with a ratchet which engages with a trundle wheel which in its turn communicates motion to other trundles and ratchet wheels, so that in the end the reciprocating motion of the spear is converted into rotary motion at an axis in line with the winding drum over the shaft. A clutch unites this axis with that of the winding drum, and the apparatus is so arranged that the contact of the raised load with a plate or lever throws the gear out at the proper moment. From the wording of the Specification it would appear that the drum is to be made capable of "alternate motion," meaning rotation in either way as the circumstance may require, so that it "draws up one basket of coals or any other weight, and lets "down another at the same time," presumably empty.

Modifications of this contrivance are described. Another form consists of "a wheel with indented teeth" "fixed fast "upon an axle," and "turned by a spear with a frame at the "end thereof, with spring stops in the inside made of metal, "which spear being moved backwards and forward pulling it "round one way and thrusting it round another."

[Printed, 8*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 133.]

A.D. 1766, November 26.—N° 865.

BARBER, John.—Raising water from mines, &c., and winding machinery.

To raise the water the main is put into connection with two cylinders, into which steam is admitted alternately. The vacuum caused by the condensation of the steam is the means of lifting the water. To wind minerals from pits, &c. a double water wheel is used. When water is allowed to flow into one set of buckets, the wheel winds one way; when the water flows into the other set, the wheel winds the other. Another system of winding engine is described in which steam power is used. The reciprocating rotation of a drum caused by the working of the pistons in the cylinders is communicated by a pair of belts, one crossed, to a pair of pulleys on the winding shaft. These pulleys are furnished with a stop apparatus, so as only to rotate in the required direction, which may be reversed when desired, or the drum may be disconnected altogether and eased off in lowering by a brake. A modification is described, but not illustrated. In this a crank is intended to be used.

[Printed, 10*d*. Drawings. See Rolls Chapel Reports, 6th Report, p. 135.]

A.D. 1767, March 13.—N° 871.

OXLEY, Joseph.—A "machine or water wheel for drawing "coal or other purposes by water, which machinery also

" counterballances ropes made use of in drawing coals or other " things."

[No Specification enrolled.]

A.D. 1767, November 2.—N° 883.

STOKOE, Thomas.—Applying horse power to winding, &c. minerals, &c.

"A Scotch or whim gin, to be turned upside down and " supported with wood, on which the " animals " to be used " are to be placed, and to draw a weight, thirty or forty " stones or thereabouts, upon a four-wheeled carriage, with " rowlers or cylinders, vertical or horizontal wheels, also " with a cap of iron upon the overtree bolt and wheels, to be " fixed to the overtree and crosstree if occasion requires " them; the rope to be used therewith in drawing " minerals, water, &c. from mines " must be an endless rope, and to pass " round a small roller to be fixed at or near the bottom of " such pitts or shafts, the better, if necessary, to guide such " rope; and when the machine is to be made use of to remove " any heavy weight or burthen to any distance, with or without a coal waggon way, then the cylinders or rollers, vertical " or horizontal wheels, must be affixed to the carriage with " irons, ropes, or wood, whereby as well the weight as the " strength of the " animals " used in drawing the same are " got."

[Printed, *4d.* No Drawings.]

A.D. 1772, November 5.—N° 1025.

BUDGE, John.—Winding machinery.

For winding minerals the patentee uses a fusee drum " upon " an inverted principle," round which the rope is coiled, " having at the same time an increasing and decreasing power, " gathering and acquiring strength as it draws." Two such drums are used, each working a rope, one being out while the other is wound up. Horse power is used.

[Printed, *8d.* Drawing. See Rolls Chapel Reports, 6th Report, p. 161.]

A.D. 1773, June 17.—N° 1044.

GULLETT, Christopher.—Winding machinery.

Water power is used by the inventor for winding by means of wheels of different kinds placed in different ways according to circumstances. In the drawing, two overshot wheels are represented side by side, having their buckets reversed, so that when water is allowed to flow from the reservoir into one wheel the rope is wound one way, and when water runs into the other wheel the action of the rope is reversed. Automatic apparatus is provided for shutting the sluices and stopping the machine, and for controlling its action a brake is provided.

[Printed, 1*s.* 2*d.* Drawing. See Rolls Chapel Reports, 6th Report, p. 161.]

A.D. 1776, March 12.—N° 1118.

BARBER, John.—Winding and pumping machinery.

The motive power for driving this machine is derived from the action of a jet of steam upon a kind of fan wheel placed horizontally on the top of the boiler. The motion of this fan wheel is communicated by gearing to the winding drum which has upon its axis a triple crank working as many beams and pump spears for draining the mine. The winding drum may be reversed by shutting off the jet and opening another which will impinge in another direction.

[Printed, 10*d.* Drawing.]

A.D. 1776, August 23.—N° 1132.

KNOWLES, William, and HOLMAN, John. — Winding machinery.

The invention consists "in the application of a ballance " weight or weights fixt to a rope or ropes, which runs over a " spiral wheel working by a counter line fastened to the cage " of the whim or gin, otherwise by the ballance rope winding " on a double spiral line formed by means of iron or wooden " cranks on the head of the cage of the whim or gin, or with " a chain or chains, rope or ropes. By either of the above " methods the cable or basket rope may be so ballanced in " the shafts as only to have the weight of the ores or other " heavy bodies to draw up."

The invention further consists in making the " body or " whelps" of a capstan or windlass "curve-like," to prevent the cable or rope surging or riding.

[Printed, 4*d.* No Drawing.]

A.D. 1785, January 15.—N° 1460.

GULLETT, Christopher.—Using wind power for pumping and winding.

The wind acts upon a kind of undershot water wheel placed horizontally. The rims of the wheel are to be lined with boards with intervals of two inches between them in such a manner as to form "so many wind buckets," in which the air is compressed or throttled and made to pass out through these openings two inches wide. Screens are provided to increase the effect of the wind, and when it is desired to reverse the motion, as in winding, the screens must be made to shift, and so bring another portion of the wheel under influence. Horse power may be applied when there is insufficient wind to do the work.

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 171.]

A.D. 1786, January 28.—N° 1525.

CAMERON, ROBERT.—Winding machinery for raising minerals and water, &c.

The object of this invention is to "put in practice the direct "application of the steam engine" for the above purposes.

Various methods of attaining this end are described, but they all embody means of converting the continuous rotation of the shaft worked by the engine in the alternate motion required for winding. In one case this is done by reversing the engine itself; in others by throwing in and out of gear spur or bevel wheels which drive the winding drum. In one machine this throwing in and out of gear is effected by means of a double cam inside of a rectangular frame to the end of which are attached the intermediary spur wheels. This cam, as an additional measure of safety, is attached to a lever which the ascending corve may touch and so throw the machine out of gear as well as put on a brake to prevent the load from descending again into the pit.

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 174.]

A.D. 1786, February 4.—N° 1529.

STOREY, JAMES.—Winding minerals. The inventor makes use of an endless rope passed round a horse whim at the top of the shaft and round a pulley or drum at the bottom. To this rope are spliced short lengths of rope to which are hung the corves or baskets. The endless rope passes over two pulleys at the mouth of the shaft on its way to and from the whim.

[Printed, 6*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 148.]

A.D. 1788, May 5.—N° 1649.

BEAUMONT, John.—Winding and pumping machinery and driving waggons, &c.

The winding and pumping machinery is worked by means of a large wheel turned by men walking inside it, and outside it on steps in the manner of a treadmill. In winding this wheel gives motion to a double coned drum, round which ropes are so arranged that one is always coming up while the other is going down. In pumping, the wheel works a crank to actuate the pump.

Similar apparatus, to be turned by hand, is shown as applied to coal waggons, and it is suggested as supplemental power for windmills.

[Printed, 6*d*. Drawing.]

A.D. 1788, August 12.—N° 1660.

CURR, John.—Winding machinery.

The shaft is fitted from the top to bottom with upright timbers constituting what are called "conductors," and may be understood as vertical tramways upon or in which the ascending and descending triangles to which the corves are attached are guided. At one place in the middle of the shaft a passing place is contrived. At the mouth of the shaft certain apparatus is erected by means of which, when the corve reaches the bank, an inclined platform falls over the mouth of the shaft, down which runs a carriage till it is arrested by stops in position under the corve. The corve is then lowered on to the carriage and disengaged from its triangle. Previously to the corve coming to bank, a string of empty corves have been placed on an inclined platform near the pit mouth. They are confined to the platform by stops and, further, have short lengths of slack chain, the use of which will be apparent. As soon as the full corve has been disengaged, the empty corves are allowed to run down their platform by removing the stops; they push off the full corve from the carriage and are detained themselves on the carriage by the lengths of chain becoming tightened. The empty corves are then liberated from the chain and hung on the triangle, the latter raised a little, or the corves drawn off by hand, the platform allowed to move on its centre, and so withdraw the carriage, leaving the shaft clear for the corves to descend. The full corve, after it is pushed off the carriage, runs on to a platform which empties it by overturning and a balance weight restores it.

[Printed, 1*s*. Drawing. See Rolls Chapel Reports, 6th Report, p. 179.]

A.D. 1789, May 12.—N° 1681.

WHITE, WILLIAM.—Ventilating mines, &c.

The ventilation is performed by means of a fan wheel revolved in a case, either by hand, water, or other power. If foul air is to be withdrawn as well as fresh air supplied, the fan is divided by a partition, so that one half may draw in the foul air at its axis and expel it at its periphery while the other half may take in fresh air at its axis and force it down the mine from its periphery, the two operations being performed together. The apparatus may of course be used for withdrawing foul air or supplying fresh air alone, in which case the partition is not needed. Two trunks leading to the workings are not needed, if it be not intended to exhaust and supply at the same time, for by a branch pipe and suitable valves the mine may be connected with the periphery or axis as required. The air may be distributed in various ways.

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 180.]

A.D. 1789, September 5.—N° 1702.

CAMERON, ROBERT.—Winding machinery and conveying minerals in pits, &c.

This invention relates to the following matters :—

A method of counterpoising the rope by means of a weight and lever which work a shaft having thereon a toothed sector gearing with a small pinion on the axis of the winding drum. When the weight hangs vertically the ropes are midway in the shaft and balanced, but as the drum is turned either way, the weight is raised from the perpendicular towards a horizontal position and thereby serves as a counterpoise.

A method of reversing the winding, and a friction brake :— As the corve or basket comes to the top, a man near the mouth of the pit, shuts off the steam and applies a friction brake to the fly wheel. The corve is then to be lowered on to a sledge or carriage at the pit mouth and to do this the brake is released and the fly and rope wheels turned partly in a contrary direction. The reversing gear is worked by the balance weight above described. As it turns to a horizontal position it raises another weight, thereby bringing into use weight greater than that of the long rope. Consequently when the loaded corve is removed and the empty one put on "the rope "wheel is acted on by a superior force in opposition to the "action of the long rope" and by means of gearing "the "crank is inclined from the perpendicular position, which it "naturally seeks" to another position from which it may start in the opposite direction.

The means of bringing the minerals to the shaft and raising them :—For these purposes endless chains or ropes are used passing round drums, and to which chains or ropes the full and empty carriages or corves are hooked. The chains which draw the carriages in the workings may be actuated by the shaft chains, or by a spear or rod passed down the shaft. The carriages run on wooden trams and means of turning the corves are provided.

[Printed, 1*s*. 6*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 180.]

A.D. 1790, October 16.—N° 1775.

HATELEY, Joseph.—Machinery for raising minerals, &c.

The motive power to drive this machinery is derived from the action of rarified air, caused by combustion in chambers designed by the inventor, upon vanes or fans. For winding, the inventor uses "a single or double fussee barrel with an hollow "arbour connected to and with a wheel or barrel for the "ropes to coil upon, and upon the periphery of the fussee "barrel a rope or chain connected to a weight, which is raised "alternately by the powers of the machine in conjunction "with the weight of the descending rope" which "weight "changes its position upon the fussee barrel at a time when "the corves or baskets containing the coal are at the meeting "or in the middle of the" shaft, when in this situation the weight of the descending rope, with "a small assistance of the "machine, raises the weight to the surface of the earth, which "weight is left in a situation to descend with the rope and "empty corf, both of which exceed the weight of the rope

" that is down in the pit, consequently there remains only the " weight of the coals to be raised by" power.

When the motion is required to be changed, the wheel and fusee barrel and hollow arbour are moved longitudinally on the driving shaft, which is fitted with the necessary gearing. When the apparatus "is applied to the powers of steam " engines in conjunction with the new pneumatic engine, or " by themselves separately, the centre or axis of the rotative " apparatus is moved longitudinally on each side, the centre " line of the spear rod being the line of direction in which the " engine receives the resistance of the reverse motion, which " axis is moved backwards and forwards on each side of the " line of direction of the spear rod by means of a lever, wheel " and rack connected with the brasses containing the axis."

[Printed, *4d.* No Drawings.]

A.D. 1791, October 31.—N° 1834.

BANKS, Richard.—Winding gear.

The ropes are passed over pulleys at the mouth of the shaft. The pulleys are supported in frames which are mounted on vertical pivots, and these frames are again fitted into another frame supported on wheels running between guides, so that the whole frame is capable of varying its position according to the strains on the ropes. The ropes are "crossed in their " directions to the wheel of the gin, whim, or barrel on which " such ropes are usually worked." "As each draws in the " same diagonal line from across the center of the pit their " forces, if equal, have a tendency to keep the pulley frame " in the center and over the center of the shaft, but if either " rope is acted on by a stronger force than the other, it has a " tendency to and does draw the pulley frame to that side of " the pit to which it points when viewed in the line of direc- " tion as seen looking to the gin, whim, or barrel."

[Printed, *1s.* Drawing. See Rolls Chapel Reports, 6th Report, p. 145.]

A.D. 1792, December 17.—N° 1924.

CURR, John.—Applying ropes for winding minerals.

Instead of using large ropes which are apt "to be in- " jured in being bent" or passed over wheels, rollers, &c., the inventor proposes to use a number of smaller ones to which the load may be attached; or in order to equalize the strain on each rope, he prefers to pass them round pulleys or sheaves, to which group of pulleys or sheaves, the load is suspended.

[Printed, 8*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 188.]

A.D. 1797, March 25.—N° 2174.

BUNTING, EDMUND.—Reciprocating winding drum.

This invention consists in obtaining forward and back motion in a rope drum. Two "sockets" or sleeves run on the spindle to which the power is applied, and each "socket" is provided with a stud working in a mortice. When the rope is fully wound on one "socket" it presses in the stud which acts on a bolt in the spindle and disengages the "socket," at the same time throwing into gear the other "socket." The rope on the first "socket" is then free to run off while that on the other is winding.

[Printed, 6*d*. Drawing.]

A.D. 1798, November 17.—N° 2270.

CURR, JOHN.—Making flat ropes for winding machinery.

This flat rope may be made by connecting two or more small ropes sideways, by sewing, lapping, or interlacing them with thread or small rope, or with brass or iron wire. This sewing may be done in various way, but the inventor describes a machine in which the ropes are passed between a set of side and top and bottom rollers, by which they will be compressed together. They are then, stitch by stitch, pierced diagonally by means of piercers mounted at the ends of levers, somewhat as in a sewing machine, and the wire or thread is put through by hand. If the ropes be interlaced or lapped no machinery is necessary, except that it would be well to draw the finished rope through a pair of rollers to flatten it for use.

When applied to use the rope "must lap upon itself in a "nich or groove that must be fixed upon the rope wheel" of the winding machinery.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 10, p. 361; Rolls Chapel Reports, 6th Report, p. 195.]

A.D. 1798, December 8.—N° 2276.

RALEY, William.—Ventilating mines, &c.

The greater part of this invention relates to an improved "philosophical furnace and boiler," the steam from which is "applicable to steam engines and other mechanical purposes, "and to various branches of pharmacy, &c."

But the furnace is also made use of for ventilating purposes. The ash pit is supplied with air through a number of smaller tubes which join one large tube, the lower end of which "terminates in the pit, mine, &c.," where "it is divided into a "number of smaller tubes, extended to different parts" to be ventilated. If the furnace should require more air the ash-pit door must be proportionately opened. If the engine to which the boiler may be attached should draw water, the latter may be used for ventilating purposes. Thus if it be allowed to flow from a reservoir into a closed box from which it will expel the air, and then be allowed to run away after the air valve is closed, it will draw foul air from the mines through a pipe into the box, and by allowing water to flow in again the operation may be repeated. The engine may be made to open and close the valves automatically.

A kind of turbine wheel is also described.

[Printed 4*d*. No Drawings. See Repertory of Arts, vol. 10, p. 155.]

A.D. 1799, February 12.—N° 2294.

JEFFREYS, Humphrey.—Winding and conveying minerals.

The minerals are brought from the workings to the bottom of the shaft by means of an endless chain passing round drums at the shaft and the end of the working. The loaded corves are hung from a cross bar furnished with wheels at each end, which run upon a framing or tramway supported on posts. At the turning places the corve is carried round upon the outside wheel, and two wheels placed close together in the middle of the cross bar above described. By this contrivance a sharper curve may be turned. The endless chain is driven by the shaft chains, and a suitable disconnecting clutch is provided between the two.

The corves are raised to the pit mouth by hanging them on to cross bars placed at intervals between two parallel endless ropes. Each chain passes over a separate wheel at the top, and the bar carrying the corve after being carried over allows the corve to descend on the other side of the shaft on to the settle boards. Wheels are placed immediately under the latter, to force the descending chains sufficiently out of the perpendicular to pass the board, the corve hanging vertically by a separate length of chain will of course land on the settle boards. This winding rope may be modified by supplying a single rope or chain with arms or bars standing out at right angles from it, and held by stay chains or ropes. The corves are hung to these arms, and the chain or rope similarly passes over a pulley or drum, the rope by which the curve is suspended hanging vertically over the end of the drum, and the corve being delivered on the settle boards as the chain or rope descends. The inventor also describes a system of parallel motion, rendering the use of a beam unnecessary.

[Printed, 1*s*. 10*d*. Drawing. See Repertory of Arts, vol. 11, p. 145.]

A.D. 1801, February 25.—N° 2484.

GIBSON, Robert.—An improved windlass, to be used for, among other purposes, "raising coal out of pits."

Over the pit mouth is placed the barrel of a windlass of ordinary construction, with handspikes at each end. Pulleys or blocks are placed at the ends of the handspikes, and ropes reeved through them are wound reverse ways round the barrel of another windlass placed some distance away, and are there secured to posts in the ground. The ends of the handspikes are also connected by a rope passed through pulleys at each end of a yard supported by a mast, on the opposite side of the main windlass. Thus when the supplemental windlass is turned by a winch the handspikes are alternately worked through the medium of the ropes and pulleys.

[Printed 10*d*. Drawing.]

A.D. 1802, April 10.—N° 2609.

CHARLTON, John.—"A punch or prop" for mines.

This prop is made of cast iron, and its length or height depends of course on the height of the working in which it is to be placed. It may be made of any thickness and shape, the invention "consisting not so much in the shape or figure" as "in the introduction and application of a new material."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 201.]

A.D. 1802, June 28.—N° 2632.

MURRAY, Matthew.—Winding machinery.

The greater part of this invention relates to an improved steam engine, and the means of producing circular motion, which part will be found treated in another series. Another part relates to winding machinery, which may be worked by this engine. In this machinery the winding drum is so arranged that for every revolution it is caused to traverse laterally on its axis by means of a screw, to the extent of the thickness of the rope. Thus all lateral friction between the coils of rope is avoided.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 2 (*second series*), p. 175; Register of Arts and Sciences, vol. 4, p. 333.]

A.D. 1802, December 21.—N° 2672. (* *)

SCOTT, John, CLARKSON, James, TATHAM, William, and MELLISH, Samuel.—Using "clumps" for the purpose of constructing water pipes, sewers, tunnels, wells, conduits, reservoirs, or other circular walls, shells, or buildings.

These clumps are composed of earth, stone, clay, plaster, cements, compositions, kiln-burnt material, masonry, or any other suitable material. They are so formed "that the sides or "edges thereof, when made and completed, shall join and fit "to each other on an exact radius of a circle, terminating of "its centre; so that when all the said parts are put together, "with or without mortar or cement, the said several clumps "will form a direct circle, bearing pressure inwards on the "principal of an arch; and that when the several layers, "courses, or distinct circles thereof shall be fitted and adjusted in their proper places, such will form what is termed "a broken joint in the wall or shell, so that the same will "alternately clamp or join the courses next adjacent to "them together, to prevent their removal sideways," such clamping or interlocking being effected by a curved projection on one of the flat sides of each clamp entering a corresponding recess in the side of the clamp above or below the same.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 2 (*second series*), p. 333.]

A.D. 1805, February 12.—N° 2822.

RYAN, James.—Apparatus for boring into the earth.

"The boring apparatus consists of two spring poles, to " which is attached by two chains or cords a rod of iron or " other metal, in joints, secured to each other by screws or " otherwise, so that said rod may be lengthened or shortened " in the usual manner; and of sundry bits or tools for boring, " to be fastened to the farther extremity of said rod, each " singly contrived for penetrating that particular species of " soil best to which it is adapted," "and of several auxiliary " implements for extracting the soil from the hole formed " by sd bearers." The boring instrument "being suspended " to the spring pole, is to be put in motion by a handle or " spur, fastened to it at right angles, or by a crank, as best " suits the work. The use of having two spring poles is to " keep the rod steady to the perpendicular line of the hole, " which a single one could not do, as its motion must be performed so as to form arcs of a circle by its extremity, which " must move the boring rod untrue to the work."

Various forms of bits are shown suitable for boring earth, stiff clay, or shale, hard rock, shale, and stone, earth, clay, or gravel when mixed with water, the last being called a "puddle " bit." Tongs for withdrawing the cores are also shown, and an instrument for taking up the mud. There are also auxiliary implements, as, for instance, one for pressing clay into the bore when a running sand is met. The clay adheres to the sand and forms a solid coating to the bore hole. Also a withdrawing implement for the tools, a chisel for separating the cores, and an anvil for forming the boring rods.

The apparatus may be used for boring minerals, sinking wells, draining lands, and ventilating mines, &c.

[Printed, 10*d.* Drawing. See Repertory of Arts, vol. 6 (*second series*), p. 324; and Rolls Chapel Reports, 6th Report, p. 153.]

A.D. 1806, April 1.—N° 2926.

MILLER, Samuel.—Working mines and sinking shafts and workings.

The inventor describes a method of sinking shafts. The " piercer" is hung in the shaft by a rope passed round a roller from which it may be payed out as needed. The roller is supported in a moveable frame. "In applying the engine

" to work the piercer, any of the ordinary methods of raising " a body a short distance and letting it fall is applicable in " this case." "If a straight rod be used as a drill, or a stroke " given upon the end of the said rod," it is necessary to "take " off part of the weight of the rods as the shaft sinks by a " counter-weight." When the work leaves the vertical position "the longitudinal direction of the piercer must follow the " line of work."

To work the mine the inventor makes use of water raised from it. The water is allowed to run from the pump to the mouth of the shaft where it is stored in a reservoir. To raise the load of mineral, water is allowed to flow into a tank on the endless winding rope, which when filled becomes a counterpoise and descending draws up the load. The tank is emptied at the bottom and the water runs by a drain to the pump of the pump shaft to be raised again to the surface. When it is desired to take down earth to form supports for the mine roof, the earth may be substituted for the water. "As it is often " dangerous to go under a roof where a pier of coals has been " thrown down previous to working down the pier by the " piercer," "ropes or chains made into a net should be laid " to receive the coals, one end of which to be fastened out" wards and the other end a single rope brought to the engine," or other power below "by which means the coals may be " brought forward."

[Printed, 6*d*. Drawing.]

A.D. 1807, April 8.—N^o. 3026.

CHAPMAN, William.—Winding machinery.

This invention relates to the preservation of the ropes used in winding by relieving them of strains and of wear by friction or deprivation of elasticity by being kept at tension on the winding barrel.

For the former purpose the inventor passes the rope over pulleys so contrived that they will yield to any severe jerk or sudden strain on the rope. The pulleys are counterbalanced in various ways by springs and weights, or the rope wheel or drum may be fitted with spring couplings so that on any sudden shock the wheel would have its motion momentarily retarded or would "move through a lesser arc," "than the " axis which follows the uniform motion of the engine."

To obviate wear of the rope it is passed over a grooved wheel or round a barrel and the two ends placed over two pulleys at the pit mouth. One end of the rope will thus be always up while the other is at the bottom of the shaft. If the rope be only passed over a grooved wheel it must be held down in the groove by holding rollers.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 12 (*second series*), p. 241.]

A.D. 1807, April 11.—N° 3032.

FORSYTH, Alexander John.—Apparatus for firing mines, &c.

This invention consists in the application of substances which ignite by percussion to the firing of gunpowder in "mines, chambers, cavities, fire-arms," &c. The inventor makes no claim as to the nature of the composition, but describes as his invention the use of a chamber communicating with the charge to be exploded and fitted with a sliding plug. The detonating composition is placed in the chamber and ignited by a blow on the sliding plug.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 11 (*second series*), p. 401; Webster's Reports, vol. 1. pp. 95 and 97 (note); Webster's Patent Law, p. 129, case 59, and Supplement, p. 20; Webster's Letters Patent, p. 20; Carpmael's Reports on Patent Cases, vol. 1. p. 401; Parliamentary Report, 1829 (*Patent Law*), p. 198; Chitty's Prerogatives of the Crown, p. 182; Patentees' Manual, p. 15; Billing on Patents, p. 41; Rolls Chapel Reports, 7th Report, p. 197.]

A.D. 1807, October 30.—N° 3078.

CHAPMAN, William, and CHAPMAN, Edward Walton.—Making flat winding ropes.

The rope or belt consists of "an equal number of strands, "each alternate one twisted the contrary way to the other, so "as to counteract the tendency they would otherwise have to "twist round one another."

These strands are laid side by side and united by sewing or rivetting. To sew them together a travelling apparatus is used which is moved along the rope stitch by stitch. An eye pointed needle is pushed through alternately from each side in a diagonal direction by means of screws. The thread is withdrawn from the eye of one needle after it is thrust through, pulled tight and then threaded into the other needle, and so on. If the rope is to be rivetted a steel piercer is substituted for one needle and a holder for the rivet-headed pin for the other. Leather washers may be placed under the rivets to prevent the rope being cut by them.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 12 (*second series*), p. 81.]

A.D. 1808, April 27.—N° 3126.

CHAPMAN, William.—Conveying coals in mines.

This invention is only applicable where there is a sufficient declivity for the carriage to run by its own gravitation. It is intended to facilitate the bringing of the coals from the workings down to the main ways of the pit. For this purpose an endless rope travels round a drum at the top of the working and round a pulley attached to a tightening carriage at the bottom of the trams by which carriage the endless rope is kept tight. Where this rope crosses other workings it is raised above them or carried below them so as not to interfere with the traffic on the cross roads. The loaded trucks or carriages with the corves are attached to the rope and by easing the break on the drum are allowed to descend to the main way by their own weight. A "counterbalance carriage" is attached to the ascending side of the rope to take off excess of weight, or the empty trucks may be made to perform this duty.

[Printed, 10*d*. Drawing.]

A.D. 1810, July 3.—N° 3358.

HOWDEN, Robert.—Ventilating mines.

The inventor describes several methods of extracting the foul air from pits and other similar places.

He connects a pipe leading from the place to be ventilated with the throat of a chimney or the ash-pit of a stove so that the air is drawn up through the rarefaction produced by combustion. In the latter case a shield is provided to prevent the ashes falling into the pipe and also to regulate the admission of the air to the fire. He also uses a pair of bellows so arranged that while one is extracting the other is being compressed to eject the foul air it has withdrawn. Or a fan worked at high speed in a chamber in the exhausting pipe may be used; and, finally, he describes a method of pumping out the foul air in a manner analogous to water pumping.

[Printed, 8*d*. Drawing. See Rolls Chapel Reports, 7th Report, p. 209.]

A.D. 1812, May 19.—Nº 3567.

SHORTER, EDWARD.—"Improvements in the construction of " tunnels and subterraneous passages."

In making a tunnel under water, for instance, the inventor builds up his tunnel in lengths of iron or other cylinders, connecting, here and there, the lengths with ball and socket joints packed with hemp. Thus he is able to construct his tunnel above the surface and to lower it gradually as he proceeds.

[Printed, 8*d*. Drawing.]

A.D. 1813, January 30.—Nº 3645.

DUNKIN, ROBERT.—Horse whims for mining.

The inventor after observing that "horse whims have been " constructed without a span beam by propping the cage but " which have not been found sufficiently strong and secure," proceeds to say that "at some distance beyond the whim but " if in line with that and the shaft the better, I erect a post, " supported on the top by props or otherwise, to which I affix " a large block or pulley, and when the rope has been passed " round the cage I reeve it through this block or pulley and " return it to the pulley over the shaft. By this method the " whim is placed nearer in equilibium than that of the old."

The invention also relates to steam engines and philosophical instruments.

[Printed, 10*d*. Drawing. See Rolls Chapel Reports, 8th Report, p. 96.]

A.D. 1813, June 29.—Nº 3711.

CURR, JOHN.—Working flat ropes in winding machinery.

For flat ropes it is desirable "that the drum should be " considerably smaller in diameter than the drums generally " used for round ropes, in order that an equalizing balance " may be effected by the flat rope lapping upon itself." If the diameter of the flat rope drum "be made in proportion to " the greatest diameter to which the flat rope coils by lapping " upon itself, as the weight of two baskets corves or tubs and " two chains added to the weight of one lift of coals, minerals, " or water is to the weight of two baskets, corves, or tubs, and " two chains, added to the weight of two ropes and one lift of " coals, minerals, or water, it will be found that the steam

" engine or the horse or horses in the gin will at all times " while" a load is being raised "have the same resistance to " overcome or nearly so."

The flat rope is preserved from injury and directed properly by means of rollers. The addition of multiplying gear to the drum is necessary for the sake of rapidity in winding.

[Printed, 6*d.* Drawing. See Rolls Chapel Reports, 7th Report, p. 114.]

A.D. 1816, May 14.—N° 4028.

HAWKINS, RICHARD FRANCIS.—"A method, plan, or principle by which tunnel or tunnels, archway or archways may " be constructed or effected under the river Thames, or other " rivers, for the passage of carriages, cattle, foot passengers, " and other purposes."

This specification illustrates and describes a tunnel formed under a river, lined with brick or other material and furnished with two vertical shafts reaching above the level of the river. The tunnel is drained into wells at the bottom of the shafts, and an external drain, beneath the tunnel also empties into these wells. The drainage water is pumped up through the shafts. During the construction of the work, a shield or " dam " is provided which is hung on trunnions at the sides. There is a groove along each side of the tunnel in which these trunnions lodge, so that the shield can be progressed as the work proceeds. The shield is usually swung open on the said trunnions but if danger be anticipated it is closed and shored up with timber struts.

[Printed, 1*s.* 4*d.* Drawings. See Mechanics' Magazine, vol. 1, pp. 225 and 244; Rolls Chapel Reports, 8th Report, p. 114.]

A.D. 1817, August 26.—N° 4163. (* *)

McCARTHY, JOHN JAMES ALEXANDER.—"A road or way for " passage across rivers, creeks, and waters, and from shore to " shore thereof, without stoppage or impediment to the constant navigation thereof, and across ravines, fissures, cliffs, " and chasms, and of a new method or methods of constructing " arches or apertures for the running and flowing of water " through the same or under bridges, to be used and applied " in the construction of the before-mentioned road or way and " otherwise."

This invention consists of "a passage suspended in a river or "in other water, and to rise and sink therein, so that such "passage shall remain at a distance from the surface of the "water sufficient to allow a ship or ships, or other vessels, to "pass over and above the said passage; and in order that the "said passage may be buoyant, the ends of the same are "formed so as to make an inclined plane from such parts of "the passage over which ships and vessels may pass, and so "as the exits or entrances of such passage project above the "surface of the water. The said inclined planes continue the "said passage, and connect the same with a floating bridge "made in the usual manner, the whole to be moved both "above and below. The said passage may be formed in the "shape of a cylinder, or any other more convenient for the "purpose, bent at each end to form the inclined planes, and "may be made of iron or other materials. The said passage "is gravelled, or may be paved as other roads. Care must be "taken to make the passage of such weight and substance as "that it will sink under the surface of the water to the required "depth, and that the inclination of the plate be such as to "allow carriages to pass up and down the same with safety "and facility. The ends of the inclined planes are to be sufficiently defended against injury from ships or vessels or other "external causes. The said passage must be placed in such "part of the water and must be so connected with the said "floating bridge as will be most suitable for the navigation. "The parts of the bridge leading from the two shores to the "said passage are formed in the usual way."

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 33 (*second series*), p. 199.]

A.D. 1817, December 19.—N° 4192.

CHABANNES, Jean Frederick Marquis de.—(*Partly a communication.*)—Ventilating mines.

The various improvements described in this specification, have reference to "warming, cooling, and conducting air in "houses, &c.," but one improvement is to be applied "for "ventilating mines." The impure air is withdrawn from the mines "by means of the rarefaction produced in" pipes, which are built in a furnace, "by the heat of the fire acting upon "their circumference." The ventilation may be effected either by one single conductor leading from the part to be ventilated to the air chamber under the furnace, "or by various con-" ductors leading to the same point from the different situations " where more than one are required to be ventilated."

The inventor also uses a fan or "ventilating air pump" described as "similar to a winnowing machine" for the ventilation of "all buildings or places where men or animals " respire."

[Printed, 1*s*. Drawings. See Rolls Chapel Reports, 7th Report, p. 119.]

A.D. 1818, January 20.—N° 4204.

BRUNEL, Marc Isambard.—Method or methods of forming " tunnels or drifts under ground." In forming a drift under the bed of a river, the inventor uses "a casing or a cell intended " to be forced forward before the timbering, which is generally " applied to secure the work . . . . The workman thus inclosed " and sheltered, may work with ease and in perfect security." In constructing larger tunnels, a number of these cells is used each lying alongside of and parallel with the other. "Each " cell may be forced forward independently of the contiguous " one, so that each workmen is supposed to operate in a small " drift independently of the adjacent one." The cells are moved by hydraulic power in preference; strong iron plates extend beyond the cell, "so as to overlap the shell or the " tunnel previously made, thus protecting the space already " cleared." Each cell is prismatic, so as to adapt itself to the area intended to be executed; friction rollers are introduced " between the opposite sides of all the cells. The inventor " also makes use of an apparatus which he calls "a teredo or " augur." It consists of a hollow central augur or cylinder through which the earth is excavated. Round this central cylinder are arranged a number of "radiant pieces," fitted at their outside edges with staves. Thus a larger cylinder surrounds the smaller, the larger cylinder being made up of the staves and the radiant pieces forming the shield or head of the "teredo." Each stave and radiant piece is capable of being separately advanced. The lip of the "teredo" consists of an iron plate attached to a portion of a cylinder extending beyond and overlapping the end of the opposite staves. "This lip is capable " of being moved round the body of the lesser teredo, and

" may be forced forwards as the work proceeds." The earth is excavated through this lip, and when it "has been moved " through a space equal to the width of a stave, the stave next " in succession must be forced forwards."

[Printed, 1*s*. Drawing. See Mechanics' Magazine, vol. 1, p. 65; Rolls Chapel Report, 8th Report, p. 124.]

A.D. 1818, March 14.—N° 4236.

READ, John, and HOWELL, William.—Working coal mines.

"Instead of working the coal by means of insulated or de-" tached pillars," the improvement consists "in getting the " coal in sections or divisions from eight to twenty yards, " more or less, in width, or as wide as the strength of the " roof will admit, one rib of coal from six to eight yards in " width, or about one half the width of the sections to be left " between every two sections." Gateways are driven at right angles out of the main gateway; these are then enlarged at the ends and worked backwards to the main gateway, leaving however a rib against the main gateway to support it. Each gateway is similarly worked back, after which the ribs are to be got. These are worked in a similar manner by driving a gateway down them and working back. The main section may alone be worked if preferred, in which case the ribs will be left much narrower, or the ribs may be made broader and also worked out as before, small portions of coal being left to support the roof.

[Printed, 6*d*. Drawings. See Repertory of Arts, vol. 33 (*second series*) p. 264; and Rolls Chapel Reports, 7th Report, p. 111.]

A.D. 1823, October 16.—N° 4853.

CONGREVE, Sir William.—Firing mines.

The inventor claims as one of his improvements the application of "self-igniting matches" to the ends of leaders or trains of mines. These matches are formed "of fulminating " silver and powdered glass, the paper case of which, by being " suddenly torn asunder, gives an instantaneous spark; the " composition contained in this cracker or match must be " surrounded with a small quantity of mealed powder, made " with oxymuriate of potash or other rapidly inflaming ma-" terial, communicating with the end of the common leader,

" so that sufficient fire may be produced to make the leader
" strike, as it is difficult to make the spark thus produced
" ignite common gunpowder."

These matches are to be ignited by pulling strings.

[Printed, 4*d*. No Drawings. See London Journal (*Newton's*), vol. 8, p. 63.]

A.D. 1824, December 18.—N° 5060.

SNOWDEN, William Francis.—Raising minerals.

This invention chiefly relates to a railway and carriage to be used thereon, which improvements will be found abridged in another series. But the Patentee describes a means of " raising " ponderous bodies up steep ascents," which apparatus may " also "be advantageously employed for transporting" such bodies "from one level to another, as in raising coal or ore up " the shafts of mines, the descending carriages passing at the " same time."

It consists of a continuous train of cogged wheels and pinions taking alternately into each other, and placed along the axis of a trunk. These wheels are put in motion at one end and by this movement a carriage or cage is worked on each side of the trunk in grooves furnished in it. The carriage or cages have racks upon them, which engage with the train of wheels, and consequently one carriage ascends while the other is descending.

[Printed, 1*s*. 10*d*. Drawings. See London Journal (*Newton's*), vol. 10, p. 337, and vol. 11, p. 148; Mechanics' Magazine, vol. 21, p. 177; Register of Arts and Sciences, vol. 3, p. 193; Engineers' and Mechanics' Encyclopœdia, vol. 2, p. 462.]

A.D. 1826, April 22.—N° 5348.

WOOD, William.—Destroying fire damp in mines.

This is accomplished automatically by the following apparatus. A clock is placed near a combination of levers in such a position that at a given hour, the descent of the striking weight will cause the levers to dip the end of a match impregnated with "oxymuriate of potash" into a small vessel containing sulphuric acid. As the weight passes the end of the lever with which it came in contact, the match will be lifted from the acid and will then take fire. This flame ignites a bundle of tow saturated with some inflammable composition to fire the gas. The flame may be conveyed to other spots by means of wires upon which are fastened pieces of saturated paper or other inflammable substance.

[Printed, 6*d.* Drawing. See Repertory of Arts, vol. 3 (*third series*), p. 430; London Journal (*Newton's*), vol. 14, p. 94; Register of Arts and Sciences, vol. 1 (*new series*), p. 177.]

A.D. 1826, December 13.—N° 5428.

HARSLEBEN, Charles.—Transferring power, for pumping, or ventilating shafts, &c.

To the source of motive power, whether steam, wind or water, is fitted a cylinder in which works a piston. A similar cylinder and piston is placed at the distant spot to which the power is to be transferred, and the bottom of the two cylinders, or in other cases both the bottoms and the tops of the cylinders are respectively connected by pipes. The cylinders and pipes are then filled with water, in the first case the lower halves of the cylinders only, in other both sides of the pistons are filled and the cylinders completely closed. As the water is compressed in one cylinder it will raise the piston in the other and vice versâ. Air vessels may be applied to the pipes near the cylinders to equalize the working.

The invention chiefly relates to ore crushing and washing machinery..

[Printed, 1*s.* Drawings. See Repertory of Arts, vol. 6 (*third series*), p. 205; London Journal (*Newton's*), vol. 2 (*second series*), p. 79; Register of Arts and Sciences, vol. 1 (*new series*), pp. 225, 243; Engineers' and Mechanics' Encyclopædia, vol. 2, pp. 49, 163.]

A.D. 1830, October 20.—N° 6018.

COCHRANE, Sir Thomas.—"Apparatus to facilitate excavating, sinking and mining."

This invention consists in the employment of compressed air in facilitating tunnelling under rivers, or other underground operations where danger from water is to be apprehended. An iron cylinder or shaft is first sunk vertically to the level of the intended tunnel. This shaft is fitted with an air-tight top and an "anti-chamber" or lock, by means of which the workman may enter the shaft without suffering the compressed air to escape.

Air is pumped into the shaft, and kept at a continuous pressure. The workmen enter the lock, close the outer door, and open communication with the shaft, by which the pressure in the anti-chamber becomes that of the shaft, upon which the shaft door may be opened for the men to enter. Bricks and materials are passed down a tube or spout, the bottom of which is in a cistern of water or "sump" hole. The column of water which will stand in the pipe, in consequence of the pressure in the shaft, will prevent escape of air. A pump is provided to remove any surplus water. After the tunnel has been some way excavated, a partition and double doors may be put up to retain air more highly compressed within the tunnel; and similarly several such compartments may be made, by which the strain on the various doors will be distributed.

Again, a communication may be effected with the tunnel by sinking a spout or tube similar to the one above described for passage of materials, through the bed of the river.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 7 (*conjoined series*), p. 304; Register of Arts and Sciences, vol. 6 (*new series*), p. 82.]

A.D. 1830, December 23.—N° 6056.

WOOD, William.—Battering ram for coal mines.

After the block of coal has been prepared by curving and nicking, a wedge is inserted and forced in, till the block falls, by means of a ram worked to and fro by manual power, on rails carried on a frame. The wedge passes through a guide box at the end of the frame, and the latter, at the end nearer the coal, is supported on a hinged leg, which would give way by the coal falling upon it without breaking. In order to prevent the coal breaking off at its face, the wedge is inserted in a hole drilled in the coal for the purpose. The drill is similarly worked by the ram and is turned partly round at each blow.

The ram is elevated to the frame, when it is wanted, by a swing board.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 12 (*third series*), p. 144; London Journal (*Newton's*), vol. 7 (*conjoined series*), p. 287; Mechanics' Magazine, vol. 15, p. 348; Register of Arts and Sciences, vol. 6 (*new series*), p. 82.]

A.D. 1831, September 5.—N° 6157.

DYAR, Harrison Gray.—"An improvement in tunnelling, or "method of excavating subterraneous excavations."

[No Specification enrolled.]

A.D. 1831, September 6.—N° 6159.

BICKFORD, William.—Fuse for blasting and mining.

A number of strands of flax, hemp, or cotton are twisted together in such a manner as to embrace within their convolutions a continuous length or train of powder. This is effected by placing a funnel containing powder immediately above the point where the strands meet in the process of twisting, the strands being brought together round the mouth of the funnel. This rope is then strengthened by winding it with strong twine, nearly at right angles to the former twist. It is then immersed in a bath of heated varnish, and afterwards coated with whiting, bran, or other suitable powdery substance to prevent sticking. The fuse so made is waterproof, and may be used "either under water or on land, in quarries of stone "and mines" as occasion may require.

The specification is illustrated with drawings representing the arrangement of a factory for making this fuse.

[Printed, 1*s.* 2*d.* Drawings. See Repertory of Arts, vol. 13 (*third series*), p. 269; London Journal (*Newton's*), vol. 7, (*conjoined series*), p. 211; and vol. 15 (*conjoined series*), p. 186; Mechanics' Magazine, vol. 31, p. 399; Register of Arts and Sciences, vol. 7 (*new series*), p. 73; Engineers' and Mechanics' Encyclopædia, vol. 2, p. 370; Webster's Reports, vol. 1, pp. 209, 211, and 214; Webster's Patent Law, p. 106 (also p. 139, cases 142 and 143); Carpmael's Reports on Patent Cases, vol. 2, pp. 449, 453, and 454; Law Journal (Chancery), vol. 8 (*new series*), p. 188; and (Queen's Bench), vol. 10 (*new series*), p. 302; Mylne and Craig's Reports, vol. 4, p. 498; Queen's Bench Reports, vol. 1, p. 938; Jurist, vol. 6, p. 167; Billing on Patents, pp. 43, 106, and 148.]

A.D. 1832, June 22.—N° 6278.

GARSED, Edward, and ROBINSON, Alfred.—Ventilating mines, &c.

A number of tubes are placed horizontally in a furnace, in such a manner that their external surfaces are fully exposed to the flame. The ends of these tubes communicate on one side with the conduit or trunk leading from the mine, and on the other side with the flue through which the foul air is to be ejected, or from which it may be utilised for warming purposes.

[Printed, 8*d.* Drawing. See London Journal (*Newton's*), vol. 2 (*conjoined series*), p. 49; Rolls Chapel Reports, 7th Report, p. 139.]

A.D. 1832, August 8.—N° 6294.

CRAWHALL, Joseph.—Making flat ropes for mines.

The inventor claims as his improvement "the making of flat "ropes of such ropes only as have been all laid as nearly as "possible of one and the same size, also laid at one and the "same time, by one and the same operation, and by one con-"nected piece of machinery, the usual precaution of twisting "what is called right and left being attended to, and stitched "together in the ordinary manner, whereby" any "unequal "stretching, tension, or wear of the flat rope" may be pre-"vented.

The separate ropes from which the flat rope is made, are all laid at the same time in precisely the same rate of twist by connecting each rope spindle with the others by means of toothed gearing.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 14 (*third series*), p. 271; London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 389.]

A.D. 1835, August 10.—N° 6875.

DOUGLAS, John Cooper.—Ventilating subterraneous and other places.

The first part of this invention relates to means proposed by the patentee for facilitating the circulation of air in mines. His object is to continue the circulation from the downcast shaft to the upcast shaft through the goaves, and this he does by constructing pillars of masonry or brickwork in order to support the roof and "to keep up the air courses in the directions to "which they were kept by the pillars of coal." These pillars may be assisted in their construction by "props and beams of "timber or iron." Brattices are also used.

In place of this system of pillars, large pipes may be employed, "on to which the roof is permitted to fall," for keeping up the air circulation.

Another part has reference to a system of utilising the draught from the upcast shaft, by means of a fan wheel which it is proposed shall work the pumping or other machinery. The wheel is placed in a chamber between the furnace and the source of the current.

The improvements further relate to methods of collecting and utilising the inflammable mine gases for lighting and other useful purposes.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1836, January 11.—N° 6978.

SLADE, Jacob Tilton.—Raising machinery for mines, &c.

The principle of this invention may be understood from the following proposition. If two crank pins be placed on the side of the periphery of a wheel, and diametrically opposite, and a rope be hung from each with a platform at its end, one rope being shorter than the other by one diameter, it will follow that as the wheel revolves, the platforms will meet when one rope is lifted to its greatest height and the other is lowest, in such a manner that any one stepping from the platform attached to the former rope on to the platform attached to the latter will, on the next revolution, be lifted through a space equal to the diameter of the wheel. By increasing the number of wheels, one for each rope, and arranging them in pairs, with their crank pins variously arranged, a chain so to speak of ascending and descending platforms is contrived. Water may be raised by a modification of this apparatus. A bucket fitted with a ball valve at its bottom plunges into the sump and when filled is raised one stage. Here a similar bucket plunges into it and removes its water, which operation is repeated till the last bucket reaches the top of the shaft, where in ascending a fixed cylinder, also fitted with a valve, becomes immersed in the water and is emptied by a pump or gutter. Boxes of minerals, &c. are raised by hooking them on one rope, whence each is removed by an automatic catch, and hung on the other at the completion of a stage.

The inventor also describes a method of raising by a kind of endless flexible ladder passing continuously round drums at top and bottom of the shaft.

[Printed, 1*s.* 2*d.* Drawings. See London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 98; Rolls Chapel Reports, 7th Report, p. 170.]

A.D. 1836, February 1.—N° 6993.

REED, Stephen.—Hooks and bows for corves, &c.

The point of each hook is made round or conical, instead of being sharp and pointed, in order to prevent the bow of the corf catching upon it, and the point protrudes somewhat outwards, so that the bow will more readily fall within the bend. A safety tongue is pressed against the back of the point by means of a spring in the shank, and this tongue may also be hung in the hook in such a way that its own weight will tend to keep it in position should the spring become incapable of acting. A bolt or shackle of about a foot long is interposed between the chain and the hook, in order that the chain may never fall on to the safety tongue, when the chain should be slack, and so free the hook. As an additional safeguard, a kind of sliding shield is fitted to some hooks which is slipped down the shank of the hook, after the bow is in position, and covers the point. It is held by a catch, both when down and up, so that in case the hook should ever be used in a reverse position the slide may be retained in its place. This slide may be used with or without the safety tongue.

The improved bows are of iron, the under or concave side being "angular pointed, or lozenge, or wedge shaped" in section. This form is chosen as being less likely to jam in the hook, or remain on its point.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1836, March 26.—N° 7044.

SMITH, Andrew, and HOOD, John Lionel. — Winding ropes.

The improved bands or ropes are made "by forming them " of a number of lengths of metal wire, composing strands " which are connected together" by means "of spun yarn " interwoven, bound round, or combined therewith, or by " sewing them together or covering them with strong canvas " or other woven fabric." The wires are slightly twisted into strands, after being coated with some preservative. The yarn may then be interwoven with the strands "by placing the " strands of wire as warp in a power loom, and throwing " or shooting the spun yarn" "between them as weft by " means of a shuttle" "the weft being beat up by the stroke " of a heavy reed;" or the wire strands may be connected by sewing them together, or by coating them with canvas and sewing it on to and between the strands.

The ends of these ropes may be connected in the usual manner, and when required to be secured to eyes or shackles, the ends of the strands may be upset and braized into conical holes or secured by screw caps.

[Printed, 6*d.* Drawing. See London Journal (*Newton's*), vol. 10 (*conjoined series*), p. 171; Rolls Chapel Reports, 7th Report, p. 178.]

A.D. 1836, April 7.—N° 7054.

SPURGIN, John.—Raising minerals, &c. from mines.

For this purpose the inventor uses what he calls "an im- " proved ladder" which consists of a pair or more of endless flat ropes passed round drums at top and bottom, and provided with cross bars or rings between them. To take up any slack there may be, the lower drum is fitted with a screw by which it may be drawn further from the upper drum. The rungs are provided with foot boards and hand rails for facilitating the ascent and descent of men. Here and there on the ladder are placed cradles for receiving the loaded trucks. The cradles oscillate on pivots according to impulses received from fixed stops. Supposing it should be desired to take up a loaded truck from a gallery as the ladder ascends. The truck is suspended by a crane over the ascending cradle and is deposited in it, the inclination of the cradle being such as to prevent the truck running out. As soon as the cradle reaches the landing place it engages with a catch fitted to a sliding trough which causes it to rock on its centre and shoot out the truck on to the new apparatus. Similarly trucks are sent down when empty. More than one pair of endless ladders and drums may be used if the shaft be very deep.

[Printed, 1*s*. Drawing. See Repertory of Arts, vol. 7 (*new series*), p. 65; London Journal (*Newton's* vol. 14 (*conjoined series*), p. 321; Mechanics' Magazine, vol. 28, pp. 335 and 394; Engineers' and Architects' Journal, vol. 6, pp. 289 and 302.]

A.D. 1836, December 3.—N° 7244.

BOOTH, Henry.—"Certain improvements in the construction "and arrangement of railway tunnels, to be worked by loco-"motive engines."

Instead of constructing a tunnel wide enough for two lines of rails the inventor puts each line of rails in a separate tunnel, each line of rails being inclined in the direction of its traffic. Thus the train will always run down hill when passing through a tunnel.

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 8 (*new series*), p. 243; Engineers' and Architects' Journal, vol. 1, p. 27.]

A.D. 1837, May 8.—N° 7368.

SPURGIN, John.—Raising minerals, &c. from mines.

This invention chiefly relates to a new form of propeller for ships in which a "self-supporting chain" is employed. The tendency of the chain to "sag" is intended to be, in a measure obviated "by constructing the links of the chains of consider-"able length, and by forming a flanch on the back of each "middle link projecting over one side and both ends, the projections overlapping part of the adjoining outer links at the "working position." Thus the chain is quite flexible in one direction but is much less so in the other. Such chains are "applicable for passing a considerable distance horizontally, "or inclined to the horizon, from a steam engine to a rigger "over a" shaft, and require "only a few intermediate supporting pulleys. Such a chain also "formed into an endless "chain, and suspended from a rigger at the top of a pit or "shaft, and passing under another rigger near the bottom of "the shaft, would by reason of its stiffness, admit of platforms "projecting horizontally being attached" upon which persons, &c. might be raised.

[Printed, 1*s*. Drawings. See Repertory of Arts, vol. 9 (*new series*), p. 203.]

A.D. 1837, June 17.—N° 7394.

BUCKINGHAM, James.—Raising water, &c. from mines.

Part of this invention relates to improvements upon the invention of Jacob Tilton Slade as described in his Specification No. 6978, A.D. 1836.

Instead of attaching the lifting rods or ropes to the peripheries of wheels, they are attached, in the present case, to levers mounted on a shaft, the other ends of which levers are connected with a double crank shaft placed parallel with the fulcrum shaft of the levers.

The inventor also describes a method of opening and closing the valves in the bottoms of the water buckets. By means of a lever actuated by a tappet on the guide rods they are opened shortly before entering the water in the buckets below, and are closed when about to rise again, by the action of another and similar tappet.

[Printed, 1*s*. Drawing. See London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 97; Rolls Chapel Reports, 7th Report, p. 187.]

A.D. 1837, November 16.—N° 7479.

FOURNESS, William.—Ventilating mines, &c.

The patentee makes use of a revolving fan, the centre of which is connected with the air ways of the mine. When in use the foul air from the workings is drawn through valves into fan and delivered out at its periphery. A modification of this apparatus is shown in which the fan is placed horizontally over the upcast shaft, and delivers the air upwards, having previously drawn it from the pit through a perforated ventilator. The patentee also describes a method of turning steam into the draught of foul air on its way to the furnace in an upcast shaft, by which improvement the air is rendered inexplosive and the draught somewhat facilitated.

[Printed, 1*s.* 10*d.* Drawings. See London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 57.]

A.D. 1837, November 16.—N° 7480.

BUCKINGHAM, James.—Ventilating mines, &c.

The first method of ventilating described by the patentee consists in drawing the foul air from the mine by means of a rotating fan which takes the air in near its centre and delivers it at its periphery. The fan is preferably placed in a casing surrounded by another casing from which it draws the air, and the delivery pipe is made larger than the supply ports in order to offer every facility to the delivery from the fan. But the fan may be used without a casing round its periphery, the foul air being freely delivered all round the circumference.

Another method consists in using a rotary fan wheel having its fans placed in an oblique direction to its axis, and which wheel is enclosed in a horizontal position in a case at the top of the shaft or pipe to be exhausted. This fan may also be used as a blower by reversing its motion.

The patentee also describes a system of double-action bellows for gaining a continuous draught.

[Printed, 6*d.* Drawing. See London Journal (*Newton's*), vol. 12 (*conjoined series*), p. 341.]

A.D. 1838, November 3.—N° 7845.

FRASER, Joseph.—Centerings for tunnels, arches and mining operations.

"The foremost or most advanced of the centres or supporters "which is to bear the foremost ends of the laggings whereon "the bridge, arch, or tunnel is to be constructed or built is "not as heretofore an interior centering to the intended arch," but it "stands at the end of the arch that is to be constructed "or built, the chief part of its substance being in the space "which will be afterwards occupied by the brickwork or "masonry of a future length of the arch, and standing opposite

" to the place of the toothing which is to be left at the end of " the arch for joining with that future length; the said fore- " most or most advanced centre or support sustaining the " foremost ends of the laggings by a suitable connexion of " these ends with its interior or concave edge, and the two " ends or feet of" this said centre "standing with suitable " sole plates, blocks, and means of adjustment, upon advanced " portions of the two side walls from which the arch is to " spring, and the hindmost vertical face of the said foremost " or most advanced centre or support having a suitable pattern " for the intended courses of brickwork or masonry formed in " relief upon it, or marked upon it, to serve as guides for " laying such courses."

There is provided "a slight temporary centre to sustain the " hindmost ends of the laggings quite independently of the " main centres, for the support of the laggings whilst the arch " is building, and before it is closed or keyed in at the top or " crown, and which slight temporary centre is set up with its " two feet or ends standing (with suitable means of adjustment) " upon supports fixed into the side walls," or on props reared " against them.

"The other centres or supporters, which are to bear the " hindmost ends and the mid-length of the laggings whilst the " arch is building on them," are " supported on a moveable " frame or platform which is let down to rest on trucks or " wheels" (after the arch is closed in) "and the said centres " are lowered so much by such letting down or to quit contact " with the laggings (leaving the same undisturbed and sup- " ported by the foremost or most advanced centre and by the " slight temporary centre), whilst the said frame or platform, " with the hindmost and middle centres is moved or advanced " forwards on its trucks or wheels, in order to carry the middle- " most centre or centres beneath the formost or most advanced " centre." When the hindmost centre is close up to the front centre "then the frame or platform is raised up so much as to " take it off its trucks or wheels, and as to carry up the hind- " most centre in contact with the foremost ends of the laggings, " and that contact is made complete, with all the several " laggings, by the aid of setting screws or wedges with which " the hindmost centre is provided" "and after that contact " has been made complete, the front or most advanced centre "may be moved or advanced forwards, leaving the laggings "undisturbed and resting on the slight temporary centre and "the hindmost centre, in order to support the arching."

The centerings are made of iron or iron and wood combined so as to enable them to be formed "like a simple bow or arch" without requiring internal framing, or at most a cross tie or bow string, "whereby the space within such centre is left clear "for the operations of the workmen."

[Printed, 1*s*. 6*d*. Drawing.]

A.D. 1839, March 20.—N° 8006.

RUTHVEN, John, and RUTHVEN, Morris West.—Ventilating mines.

These improvements relate to steam boilers and propelling vessels, but a part relates to the ventilating of mines, &c. For this purpose the inventor makes use of a "fanner" or "wheel "enclosed in an air-tight case, with a pipe communicating "with the centre of the wheel, and another from the edge of "the case; from this latter pipe any number may be taken "and distributed" into the mine or elsewhere.

[Printed, 1*s*. 2*d*. Drawings. See Repertory of Arts, vol. 13 (*new series*), p. 78; Mechanics' Magazine, vol. 32, p. 156; also vol. 40, p. 90; Practical Mechanics' Journal, vol. 3, pp. 71, 88, 110, and 258; and also vol. 4, p. 17; Inventors' Advocate, vol. 1, p. 115.]

A.D. 1842, February 8.—N° 9249.

BIRAM, Benjamin.—Ventilating mines.

This invention relates to the construction of vanes or floats of various kinds of fans, sails, or propellers, and a part has reference to the best form of fan for mine ventilation. For this purpose the vanes or floats have curvilinear surfaces presenting at their extremities angles preferably of fifty-six degrees with the plane of motion and thence, with gradually increasing angles to the other extremities. To give these vanes their proper curvature it is recommended that they should be formed on pattern blocks. These blocks are to be cast in moulds made as follows:—A vertical pin is placed in the base of the mould and occupying the position of the axle of the wheel. On this pin is a sleeve carrying an arm at right angles with the centre pin. At the distance of the radius of the wheel there should be an inclined plane, "at such angle as might be intended for "the extremity of the vane," the perpendicular of the incline "being equal to the proposed breadth of the wheel." If the extremity of the horizontal arm be made to ascend the inclined plane, the other end will rise perpendicularly upon its centre, the sleeve being moveable on its axis, and the curved line described by the under side will be the helical curve required and to which the sand should be arranged.

A fan so constructed may be placed at the bottom of the shaft and actuated by a falling stream of water, on vanes curved in opposite directions to the air vanes, or it may be placed above ground and driven by the wind, or in its absence by a weight allowed to descend the shaft and pulled up, when run out, by manual or other power.

[Printed, 10*d.* Drawings. See Mechanics' Magazine, vol. 37, pp. 321, 366, vol. 40, p. 248; vol. 46, p. 121; and vol. 50, p. 1; Record of Patent Inventions, vol. 1, p. 13.]

A.D. 1842, July 9.—N° 9414.

BOOTH, JOHN PETER.—Raising and lowering in mine shafts and ventilating mines.

For the purpose of ensuring safety to the cage in case of a breaking rope, a lever is fitted to the top of the cage, the long end of which is held up by a link attached to the winding rope. If the rope should break, the long end of the lever would fall and the short end would engage with a rack placed vertically in the shaft and so the cage would be arrested immediately and prevented from falling. As an additional safeguard a small rope is connected with the short end and so secured above the shaft to the winding gears that in case the lever did not act promptly on the breakage of the rope, the short end would be lifted into the rack by the small rope. A barred platform is fitted over the cage to protect it from the falling rope. The platform opens out under pressure.

As a means of lifting cages &c., the inventor proposes to place a vertical screw shaft in the pit, into the thread of which work rollers on the cage. A continuous revolution of the screw shaft on its axis will then bring the cage to the top.

The rollers are so arranged that in passing the gaps in the thread necessary on account of the supports, one at least will be always in contact with the screw-thread. The bottom of the screw shaft is fitted with gear for driving a ventilating fan or other such apparatus.

[Printed, 10*d.* Drawing. See London Journal (*Newton's*), vol. 23 (*conjoined series*), p. 85; Record of Patent Inventions, vol. 1, p. 448.]

A.D. 1843, January 19.—N° 9598.

SUNDERLAND, Thomas.—"Accelerating the flow of water, " air, and other fluids through shafts, pipes, and other " channels."

A part of the improvements described in this Specification relates to the use of a fan for increasing a draught through shafts, &c. The air passes along a flue or conduit to the centre of the fan and is forced more rapidly by it along another shaft or continuation of the former.

A valve or damper is fitted on the conduit.

[Printed, 6*d.* Drawing.]

A.D. 1843, February 20.—N° 9638.

NEWTON, William.—"An improved system of working coal " mines and quarries of stone, marble, and slate, which may " also be applied to the making of tunnels, borings, or to other " purposes of the like kind."

The inventor cuts out blocks of stone or other substances by means of "rotary saws, pecks, or cutters," which blocks are withdrawn by means of hooks and ropes actuated by certain mechanism. The hooks withdraw the block on the platform of the apparatus, when it is lowered to the truck. "When there " are not a sufficient number of sides of the mass exposed" for the saws to operate upon so as to detach a block, "or when " it is desired to form a cavity," the inventor uses "a number " of saws, teeth, or rasps, placed side by side upon a cylinder. " . . . Each succeeding tooth projects on the side of the " cutting line of that immediately before, by which arrangement the mass will be completely chipped away, and a cavity " formed equal to the breadth of the cylinder of saws." These combined saws may be placed upon an axis, and a cavity of any breadth may be chipped away by shifting the machine sideways, or allowing the cylinder to rise and fall until there be space to receive the saws which cut out blocks. If desired the latter saw may act in concert with the combined saw.

[Printed, 2*s.* 2*d.* Drawings.]

A.D. 1843, April 20.—N° 9702.

BODMER, John George.—Pumping and winding machinery.

The winding is performed by apparatus of the following description :—A toothed fly-wheel gears into a pinion on a shaft carrying two bevel wheels running loose. These bevel wheels carry spur pinions on their bosses, which gear into spur wheels on the rope pulleys. Rims are cast on to the bevil wheels turned up on the inside and fitted with friction pieces which are set up by a kind of knuckle joint worked by a lever and so throw each bevel wheel into gear as required. Between the two bevel wheels is another bevel wheel similarly fitted with friction segments, in such a manner that the lever can never be moved over one side to the other without putting them into action and so acting as a brake on the gear.

[Printed, 3*s*. 8*d*. Drawings. See Mechanics' Magazine, vol. 39, p. 431.]

A.D. 1843, June 15.—N° 9776.

PAYERNE, Prosper Antoine.—Purifying air in mines, &c.

The foul air in the mine is purified by passing it through water in which chemical reagents are dissolved or held in suspension. The air is passed over spongy platinum to convert the hydrogen that may be contained in it into water, and the carburetted hydrogen is disposed of by the use of a galvanic battery. To cause the vitiated air to flow through the purifying apparatus, any suitable blowing or exhausting apparatus may be employed. The inventor describes a machine for this purpose. A bell dipping into water is reciprocated by means of a piston worked by water pressure in a cylinder.

A supply of oxygen is intended to be furnished to persons confined in places wherein they are likely to suffer from want of ventilation. This supply is contained in flasks of "ferrate "of potash," and all that has to be done when oxygen is needed "is to throw a few pieces of the ferrate of potash into a little "water, when a fresh supply of oxygen will be immediately "evolved."

[Printed, 1*s*. 4*d*. Drawings. See Mechanics' Magazine, vol. 40, p. 1.]

A.D. 1843, August 31.—N° 9877.

FRANCHOT, Charles Louis Felix, and DU MOTAY, Cyprien Marie Tessié.—"Connecting and laying pipes or

" vessels beneath the surface of water for the purpose of
" forming therewith tunnels or viaducts."

The inventors claim the following :—

(1.) The application to pipes of certain apparatus consisting of "false bottoms or ends and tightening screws," so adjusted as to permit of the pipes "being placed under water without " admitting the water within them, and of their being con- " nected together under the water with a water-tight joint, by " drawing them together from the inside of the pipes, and of " establishing afterwards an uninterrupted passage through " the pipes by the removal of the false ends."

(2.) The application of "catches or hooks, grooves, guides," for guiding the descent of the pipes and laying them in their places opposite to one another under water.

(3.) A combination of a ball and socket joint with suitable packing and "centre pins or axes," so that while the joints of the compound pipes are sound and water-tight, and are accessible and capable of being adjusted from within side the pipes, the pipes shall at the same time have a slight capability of motion about their centre pins or axes, so as to conform to the ground.

(4.) The use of studs screwed from the inside of the pipes for the purpose of supporting them, or of "anchor fastenings" suspended from the circumferences of the pipes by levers which hang upon centre pins in brackets cast on the pipes, for a similar purpose.

[Printed, 3*s.* 4*d.* Drawings.]

A.D. 1844, February 8.—N° 10,045.

NEWTON, William Edward.—(*A communication.*)—Raising machinery for mines.

Two atmospheric tubes are placed vertically in the shaft, their pistons being joined together by a platform upon which the truck is carried. The longitudinal valves in the tubes consist of india-rubber tubes or cushions inflated with air, forming lips between which the connecting bar of the piston passes. The air is exhausted from above and as the platform ascends air flows in at the bottom of the tubes through valved orifices. Similarly, as the platform descends, air valves are opened at the tops of the tubes and the air flows out at the bottom under the pressure of the descending pistons. These air trunks also serve as ventilating tubes for the mine. Stop levers are provided at top and bottom to steady the platform while the truck is being removed or loaded.

The invention chiefly relates to atmospheric railways.

[Printed, 4*s*. 2*d*. Drawings.]

A.D. 1844, April 10.—N° 10,139.

MURRAY, James.—Lighting mines, caverns, &c., with gas.

The inventor does not claim any particular apparatus for making or using the gas. It may be made above or below ground and carried into the workings through flexible or other pipes and burned in unprotected or protected burners as required. The use of gas, he says, will greatly facilitate ventilation, and "fire damp, foul air, or other noxious vapours" will be gradually consumed by the burning gas.

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 4 (*enlarged series*), p. 240; Engineers' and Architects' Journal, vol. 7, p. 423.]

A.D. 1844, May 7.—N° 10,174.

GRANT, James.—Ventilating mines.

A boiler is placed at the bottom of the shaft, and from it a steam pipe circulates round the workings of the mine and returning, terminates at the bottom of an upcast main close to the boiler. Here and there in the steam pipe are placed trumpet-mouthed openings for the collection of the noxious air by means of the current of steam along the pipe. The air is drawn into the pipe and carried with the steam into the upcast main. A jet from the boiler helps to force it up the main and a fan at the top also assists. Fresh air is forced down another main by a fan or other apparatus, and is warmed by conducting it in pipes through a chamber through which the current of steam above named passes. Syphon traps are placed at intervals in the steam pipe to remove any water of condensation.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1844, July 12.—N° 10,258.

BEART, Robert.—"Apparatus for boring in the earth and in "stone."

The object of the inventor is to remove the debris caused by the boring tool, by means of a stream of water. The Specification describes the use of the invention in boring a well. The boring tool is carried at the end of a long tube, which may be added to as the work proceeds, and which also forms one leg of a syphon. The bore hole, or excavation made at starting, is kept constantly filled with water, which passing up the boring apparatus or syphon leg, carries with it the debris from the working of the tool. If desired the water may be supplied down the boring apparatus, and allowed to overflow at the mouth of the boring, similarly carrying with it the debris.

[Printed, 1*s.* 2*d.* Drawings. See Repertory of Arts, vol. 5 (*enlarged series*), p. 239; Mechanics' Magazine, vol. 42, p. 111; Artizan, vol. 3, p. 70; Engineers' and Architects' Journal, vol. 8, p. 56.]

A.D. 1844, October 24.—N° 10,364.

CARBINES, Henry.—Mining fuses and cartridges.

The inventor proposes to make fuses in the following ways: —By filling a leaden pipe with powder, and then rolling it out to small dimensions which rolling also condenses the contained powder and makes it fitter for fuse purposes; by enclosing this fuse in an envelope of "iron or tin plate or zinc;" by passing a skelp of metal through rolls to close over the edges and at the same time pouring in a small stream of powder; by coating these metallic fuses with waterproofed and fireproofed canvass or cloth, or rendering uninflammable a fibrous fuse, like the Bickford fuse, and countering it with wire coated with caoutchouc. This fuse is made by twisting the strands round the neck of a funnel containing the powder and compressing the rope so formed by a collar, after which it passes through a chamber containing the melted preservative composition, the surplus quantity being removed by passing the rope through a suitably sized aperture. The rope is then countered.

Cartridge cases are to made of soft metal, the mouths of which cases may be choked by string, and when intended to be used may be easily opened out by the fingers. They are also to be made of paper or cloth, or both, rendered uninflammable.

[Printed, 8*d.* Drawing. See Mechanics' Magazine, vol. 46, p. 494.]

A.D. 1845, February 8.—N° 10,512.

GREEN, Darius Isaac.—Raising machinery for mines, &c.

The apparatus as applied to mine shafts, consists of an atmospheric tube extending from the top to the bottom. This tube has a longitudinal trough formed upon its surface in which is contained a flexible diaphragm. On the faces of sides of the trough are racks in which palls on the cage engage, in order to prevent a sudden descent of the cage should the machinery fail. Guide wheels on the cage run on the sides of the racks and brake blocks are provided to slide on the outer sides of the trough. A propelling wheel runs on the diaphragm, and the cage is raised by allowing the compressed air in the tube to bulge out the diaphragm below the propelling wheel, and so gradually to lift the cage before it. The upper part of the diaphragm is open to the air and the lower is closed. In descending, the compressed air is not used, the cage being eased down on the brake.

This apparatus may also be used for transport in the workings of the mine, a railway being added for the trucks to run upon.

The air tube is also used to effect the ventilation of the mine.

[Printed, 3*s*. 6*d*. Drawings.]

A.D. 1845, March 27.—N° 10,579.

LIEBHABER, Joseph Conrad Marie, Baron de.—(*Partly a communication.*)—Blasting for mining and other purposes.

The object of the inventor is to form an enlarged chamber at the end of the usual powder hole, for the purpose of obtaining greater effect by the explosion of the powder. This he does by introducing dilute muriatic acid at the bottom of the hole or drift, by which means the rock is dissolved away till a sufficiently large chamber is formed. The acid is passed in through a tube, and the remaining part of the hole is protected by another and larger tube, or by a lining of marine glue. In case there should be fissures in the rock, by which the acid would pass away, they may be stopped by introducing plaster and water. The tube by which the acid is passed in, is curved at the end to prevent the passing up of the froth, and suitable precautions are taken for the collection of the carbonic acid gas evolved during the destructive action of the acid on the rock.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 6 (*enlarged series*), p. 280; Engineers' and Architects' Journal, vol. 8, p. 385.]

A.D. 1845, July 3.—N° 10,752.

MATHER, William, and MATHER, Colin.—Machinery for boring earth and stone.

The boring head is suspended in the hole and raised and dropped by means of a cam acting on a lever to one end of which the boring head is suspended. The means of suspension is a flat band of iron or flat hempen rope, which is coiled round the winding drum above the lever, and which passes through a suitable attachment at the end of the lever. The other end of the lever is provided with a counterbalance. In order to rotate the boring head at each stroke, the swivel to which the band or rope is attached, is free to slide on the boring bar. The boring head is arrested by its blow at the bottom of the bore, but the swivel continues to descend by its own gravity until it comes against a shoulder or collar provided for the purpose; but it is prevented from making any rotation by a ratchet and palls. At the same time, in consequence of an inclined feather formed on it, it compels a frame, also fitted with ratchet and palls, to turn partially round to the extent of the incline of the feather; and when the apparatus is lifted by the cam the frame becomes stationary and thus compels the swivel to move round a distance also equal to the incline of the feather. Thus a twist is put into the suspending band or rope, but as the boring head is lifted free of the feather and liberates the cutters from the bottom, the whole head turns the reverse way by the twist which was put into the belt, and thus the cutter block is continually rotated.

The cut or pulverised stone or earth is removed in a cylinder fitted at the bottom with clacks, inside which cylinder is a bucket also fitted with clacks and which is repeatedly raised in the cylinder after the manner of pumping. A cutter block for widening the hole is also provided, and a receiver which is put at the bottom of the hole to collect the debris caused by such cutter.

[Printed, 2*s*. 10*d*. Drawings.]

A.D. 1845, August 9.—N° 10,814.

HIGSON, Peter.—Reversing winding machinery.

This invention consists in a friction clutch to be applied to machinery of various kind, including the above, where it is necessary that their motion should be capable of being frequently reversed. A pair of toothed bevel wheels are placed loosely upon the main shaft and they are so arranged that they gear into another toothed bevel wheel on the axis of the winding drum. A friction cone is provided for each of the first pair of bevel wheels and these cones slide on the main shaft, but are compelled to revolve with it by means of a feather on the shaft. The cones are slid on the shaft by means of a movable axis contained in a hollow in the shaft and worked by a screw. As each cone is engaged with its bevel wheel so that wheel is made to rotate with the main shaft, and being in gear with the bevel wheel of the winding drum, the latter is rotated in either direction according to the bevel wheel in gear.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 90 ; and Patent Journal, vol. 1, p. 305.]

A.D. 1845, October 10.—N° 10,877.

KNOWLES, JAMES, junior, and WOODCOCK, ALONZO BUONAPARTE.—Raising and lowering in mines.

The raising and lowering is performed in a vertical tube in the shaft, by means of atmospheric pressure. A piston is propelled in the tube by exhausting from the top, the cage being suspended by rods from the piston. The top of the tube is sealed, and is provided with a door through which access is obtained to the cage. As soon as the piston reaches the top it puts in action a set of levers, by which a relief valve is opened in the tube and the cage itself secured. The lowering is effected by allowing air to pass in through the valve, or it may be admitted through the piston by a valve under control from the cage. A governor may also be fitted to the cage and driven by a friction wheel running against the side of the tube. This governor is intended to open or shut the valve according to the speed and so to regulate the descent. The piston may be propelled from below if preferred, in which case the bottom of the tube must be closed and the top left open. Or two tubes may be used connected at the bottom, in which two cages may work alternately, ascending and descending.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 1.]

A.D. 1845, November 6.—N° 10,928.

BICKFORD, JOHN SOLOMON, SMITH, GEORGE, and DAVEY, THOMAS.—Miner's fuses.

Part of this invention relates to improvements on the subject of the Patent granted to William Bickford on 6th Sept. 1831, (No. 6159).

Apparatus is described by means of which more than one strand may be twisted at a time, and several funnels for the powder are provided. In order to insure greater regularity in the supply of the central stream of powder, a thin thread is drawn down the centre of the funnel through the powder and twisted into the fuse. This keeps the powder in motion and furnishes a regular supply. An improvement in the coating or varnish is also described with the view to obviate the after combustion and smoke. This coating is made of glue, yellow soap and whiting. For sub-aqueous fuses, to prevent the ill effects of cracking, the fuse is wound round with brown paper before the varnish is quite set, and then countered with thread.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 312.]

A.D. 1845, November 15.—N° 10,941.

PALMER, Thomas.—Gear for winding machinery.

The patentee describes three methods of obtaining rotary motion for winding.

In the first of these methods, two rods or bars are joined at one end to the beam of the engine, and at the other to a bar carrying a pall at each end. These palls take reverse ways into a ratchet wheel. As the beam reciprocates one pall is always in gear with the ratchet, and the other loose. Thus the ratchet wheel is continuously rotated.

According to the second method a frame, with racks attached inside its sides, engages with a couple of spur wheels as it reciprocates. The spur wheels can only revolve with effect in one direction. Thus, at each reciprocation of the frame, one spur wheel revolves loosely and the other, by means of a ratchet, turns the shaft.

In the third method the frame is also used, but two pairs of pinions and ratchets are fitted on a keyed boss which slides on the shaft by means of a hand lever. "When the two sets of " wheels are brought by the lever into such relative positions " that the interval between them comes directly opposite the " racks" in the frame, then "the machinery is out of gear;

" but when the lever is then shifted to either side the sliding " boss causes the wheels on that side to gear with the adjoin- " ing racks," and then the shaft is revolved.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 29 (*conjoined series*), p. 31.]

A.D. 1846, February 11.—N° 11,077.

CLARKE, THOMAS, FREEMAN, MARK, and VARLEY, JOHN. —Machinery for "excavating, tunnelling, dredging, boring, " drilling, crushing, and other like operations."

Several kinds of machinery are described in this specification, but they are mostly modifications of one design. The first machine acts somewhat in the manner of a pile driver. The cutting tool takes the place of the monkey, and it is raised by atmospheric pressure acting on a piston, contained in a long tube placed on an incline behind the machine. The tool falls by its own weight and in falling cuts off a slice of the earth or breaks up the stone, by means of blades or teeth, as the case may be. The debris falls on inclined planes which, partly by the help of the tool in rising and partly of themselves, throw it into wagons. This apparatus is modified in various ways. In one machine the cutter is shaped somewhat like a dredging bucket and is attached directly to the piston by means of a bar which works in a valve slot in the tube, as in an atmospheric railway. This cuts in its upward stroke. Another machine cuts in both strokes, and another is mounted on a radial frame. The vacuum is caused by an air pump conveniently placed; or, if desired, steam may be used.

According to another plan, the cutting or boring tool is attached directly to a piston rod worked by a cylinder hung in the framing on gudgeons, so as to be capable of being kept up to the work by screw gear, and of being directed in various positions.

[Printed, 7*s*. 6*d*. Drawings. See Mechanics' Magazine, vol. 45, pp. 217 and 252; Artizan, vol. 6, p. 214; Engineers' and Architects' Journal, vol. 10, p. 91.]

A.D. 1846, March 11.—N° 11,127.

STRUVÉ, WILLIAM PRICE.—Ventilating mines.

The furnace in the upcast shaft is dispensed with, and the latter is connected, by means of passages, with two tanks. In each of these tanks is a bell reciprocated by a steam engine. The passages from the shafts to the tanks are provided with valves, so that as each bell or cylinder is raised the air from the mine will enter it from below while that already above the bell will be expelled at the top, and as each is depressed the air will enter the tank from above and that in the bell will be expelled through another valve. Thus, at each alternation, air will be drawn from the mine on one side of the cylinders and that already drawn will be expelled into the open air on the other.

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 8 (*enlarged series*), p. 193; Patent Journal, vol. 1, p. 295; Engineers' and Architects' Journal, vol. 9, p. 321.]

A.D. 1846, March 11.—N° 11,129.

BOVILL, George Hinton, and GRIFFITHS, Robert. — Hoisting machinery for mines.

Two connected vacuum pipes are placed in the shaft. They have longitudinal slits covered with air-tight flexible diaphragms. The pistons carry wheels which, being of larger diameter than the tubes, bulge outwards the diaphragms, and support between them the platform on which the load is placed. The bottom of the exhaust main is connected with a ventilating pipe leading to the workings, and this pipe is also connected with a small main leading to the top of the shaft, where, by means of a slide valve, it may be put into communication with the exhaust main or the air pump. The junctions of these pipes at the bottom are valved.

When the load is to be raised, the top of the exhaust main is connected with the exhausting engine by means of the slide valve. The foul air from the mine rushes into the main under the rising pistons. When the load reaches the top, the exhaust is stopped. When the platform is to be lowered again the slide valve connects the foul air main with the upper side of the exhaust main, so that the foul air which filled the main under the pistons is now forced upwards to the other side of the pistons, and thence is removed by the exhaust at the next ascent.

[Printed, 2*s*. Drawings. See Patent Journal, vol. 1, p. 273.]

A.D. 1846, April 21.—N° 11,174.

BELL, William Heward.—A pick for getting coal.

A heavy bar fitted with a cross handle at one end and a pick socketed at the other is suspended from a frame at the face of the coal. It is worked by swinging it against the coal, and by its use it is claimed "the quantity of coal taken away in "making the 'curvings' will be much diminished and less "small coal will consequently be produced."

[Printed, 6*d*. Drawing.]

A.D. 1846, June 2.—N° 11,236.

PERCY, William Carter Stafford. — Improvements in bricks, &c.

Part of this invention relates to a "new form of brick used "for building bridges, viaducts, tunnels," &c.

These bricks are of various patterns, but they are so formed that by means of notches or serrations, each brick "shall abut "or bear upon the one next to it, thus giving a peculiar firm- "ness and solidity to the structure." These bricks "may be "modified in their bearings from the perfect square to any "bevil or angle."

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 264.]

A.D. 1846, October 8.—N° 11,406.

STRUVÉ, William Price.—Raising in mines.

The load is carried on a piston worked in a trunk by atmospheric pressure. The inventor claims the method of producing the vacuum for this purpose. The air is exhausted by the reciprocations of a pair of gasometer bells in tanks of water, the passages between the shaft or trunk, the bells and the open air being suitably provided with valves.

The invention has reference also to atmospheric railways.

[Printed, 1*s*. Drawings. See Repertory of Arts, vol. 9 (*enlarged series*), p. 277; Patent Journal, vol. 2, p. 767.]

A.D. 1846, October 8.—N° 11,407.

TAYLOR, John. — (*A communication.*) — Gun cotton for mining and other purposes.

The cotton or other vegetable fibre, is immersed in a mixture of one measure of nitric acid of from 1·45 to 1·50 specific gravity and three measures of sulphuric acid of 1·85 specific gravity. The fibre is then removed, squeezed, allowed to stand, covered up, for an hour, squeezed again and well washed. The last washing is performed with a solution of carbonate of potash, and the fibre is finally immersed in a weak solution of nitrate of potash and dried. The resulting explosive cotton may, if desired, be pressed into moulds, the size of the cartridges required, before drying. When dry the shapes will be retained.

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 9 (*enlarged series*), p. 292; London Journal (*Newton's*), vol. 30 (*conjoined series*), p. 253; Mechanics' Magazine, vol. 46, p. 358; Patent Journal, vol. 1, p. 383; and vol. 2, p. 771; Engineers' and Architects' Journal, vol. 10, p. 142.]

A.D. 1846, November 12.—11,447.

SMITH, George.—Fuse for mining, &c.

This fuse consists of a train of powder enclosed in an envelope of gutta percha. The gutta percha is placed in a cylinder fitted with a piston and warming apparatus. The piston forces out the soft gutta percha through an orifice at the bottom of the cylinder, and the powder is conveyed downwards through the axis of the cylinder by means of a tube which forms the core of the die or orifice, in such a manner that the gutta percha is expressed in the form of a tube filled with powder. A thread is drawn down through the powder tube to keep the powder in motion and so to ensure a regular supply.

Fuses of other descriptions, such as Bickford's fuse, may be coated with gutta percha by passing them through the cylinder containing plastic gutta percha under pressure.

[Printed, 6*d*. Drawing. See Mechanics' Magazine, vol. 46, p. 474; Engineers and Architects' Journal, vol. 10, p. 179.]

A.D. 1847, January 28.—N° 11,548.

TAYLOR, James.—(*A communication.*)—Boring apparatus.

The object of the invention is to provide a receiver for the debris of the boring. A hole or passage is constructed upwards through the tool and its socket, at which place it is fitted with a valve opening upwards. A tube is screwed above this, and the whole boring apparatus hung in a slotted link to prevent concussion. The borings pass up through the tool into the receiver.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 31 (*conjoined series*), p. 32.]

A.D. 1847, February 1.—N° 11,557.

FOURDRINIER, EDWARD NEWMAN.—Safety apparatus for mines.

This apparatus is so contrived that as long as the cage is suspended by the ropes, it will be free to move up and down between guides in the shaft. But immediately the rope breaks sets of springs, which have previously been in compression, depress a pair of levers, by means of which wedges are driven in between the cross bar of the cage and the guides.

Injury from the falling rope is guarded against by enclosing it in a pipe or shield. This pipe has a slit from end to end through which passes a stayed arm carrying the cage. The arm presses against the pipe through a friction roller, or there may be an additional rope on the opposite side of the pit, so that the pull may be applied over the centre of the weight.

[Printed, 1*s.* 4*d.* Drawings. See Patent Journal, vol. 3, p. 259.]

A.D. 1847, March 16.—N° 11,626.

TUCK, JOSEPH HENRY.—Ventilating mines, &c.

The principle of this invention consists in "passing currents "of air by inclined passages over or through the discharging "apertures of a chimney or other ventilating orifice, for the "purpose of producing a partial vacuum within." Various methods of carrying this principle into practice are described by the inventor.

[Printed, 8*d.* Drawing. See London Journal (*Newton's*), vol. 32 (*conjoined series*), p. 197.]

A.D. 1847, June 12.—N° 11,744.

WILCOCK, JOSEPH.—Ventilating mines.

The draught in the mines caused by the current of air up the upcast shaft, is intended by the patentee to be intensified by building a shaft or chimney in continuation of the upcast shaft to a height of sixty or one hundred feet. The area of the chimney is to be at least as large as that of the shaft.

Various methods of adapting the invention to shafts are described, by which, if necessary, the winding, pumping, and ventilating may be performed at the one shaft. In this case the shaft is divided into three by parallel partitions the centre being used for winding, the one side for ventilation, having the chimney built over it.

[Printed, 1*s*. Drawing. See London Journal (*Newton's*), vol. 31 (*conjoined series*), p. 406; Patent Journal, vol. 4, p. 76; Engineers' and Architects' Journal, vol. 11, p. 22.]

A.D. 1847, October 21.—N° 11,913.

GARD, William Gostwyck. — Machinery for boring and sinking.

The "cutting ends or bits" are made of an "inverted cup-" like or concave form, divided by a cross into four segments, " with apertures leading from these segments into a hollow " cylinder or shaft, screwed into the neck of the bit." These apertures meet and are fitted with a ball valve, so as to allow the passage of the bored out materials into the hollow cylinder. The sides of the cup-shaped tool are perforated with holes to prevent the formation of a vacuum in the segments of the cutting face.

The boring tool is suspended to a lifting bar which hangs vertically between two friction rollers. As the rollers are rotated they draw up the bar, and on arriving at the proper elevation the grip of the rollers is removed and the bar falls by its own weight and with it the tool.

By another arrangement the lifting bar is raised by a cam or wiper on a revolving shaft. The tool is hung to the bar by a chain which may be let out as the boring progresses.

[Printed, 1*s*. 6*d*. Drawings. See Mechanics' Magazine, vol. 48, p. 433; Artizan, vol. 6, p. 130; Patent Journal, vol. 4, p. 570; Engineers' and Architects' Journal, vol. 11, p. 170.]

A.D. 1847, December 22.—N° 12,002.

PUIS, Pierre Augustus. — (*A communication.*) — Raising, lowering, and pumping in mines.

The first portion of the Specification is devoted to the description of methods of raising by atmospheric power. Various ways of accomplishing the object are shown. In some, pistons carry the loads inside the air tubes, in others, the tubes are slotted and valved and the cages are attached to the pistons by means of arms. In the former a door or kind of air-lock is formed at the top of the tube for the removal of the load without destroying the vacuum below in the tube.

Weights may also be raised by means of alternately reciprocating rods, extending from top to bottom of the shaft. These rods are geared at top and bottom by means of racks and pinions, so that they are always "drawn and not pushed." Hooks or steps are formed at the backs of the rods upon which the boxes are hung by a pair of spring hooks, one hook resting in one step and the other hook in another. As one rod descends the hook on that side slides over it until the hook falls into the next step. Then, as this rod rises it lifts the box and the other hook slides and so on. The boxes are sent down by hanging them on rollers which run between the rods, and fall stage by stage in a converse manner to the action of the hooks and steps. Water may similarly be raised.

Finally, the Specification describes a method of actuating pumps in the shaft by connecting them with cylinders and pistons worked by atmospheric power communicated through one air main from a cylinder and piston above. Each pump pumps into the reservoir of the pump above it.

[Printed, 1*s*. 4*d*. Drawings. Patent Journal, vol. 5, p. 150; Engineers' and Architects' Journal, vol. 11, p. 248.]

A.D. 1848, December 28.—N° 12,391.

CHOWNE, William Dingle.—Ventilating mines, &c.

The inventor proposes to raise a "tall chimney over the "upcast shaft, so that the downcast shaft and the mine below "shall be the shorter leg of an atmospheric syphon, and the "chimney and upcast shaft the longer leg of the syphon." Parts of mines may be provided with apparatus founded on the same principle of atmospheric syphon, but one chimney will be sufficient. "It is not essential that the passage constituting "the shorter leg should be closed from its upper part downwards," for "if there be openings at several places the air "at the upper part enters, and it also enters at any opening "or openings lower down."

[Printed, 4*d*. No Drawing. See Repertory of Arts, vol. 14 (*enlarged series*), p. 89; Mechanics' Magazine, vol. 51, p. 16; Patent Journal, vol. 7. p. 172.]

A.D. 1849, January 11.—N° 12,406.

LOAM, Michael.—Mining fuses.

This invention consists in means of manufacturing such fuses of "calico or other flexible fabric or material to form an internal tube to receive the powder."

A strip of calico is passed along a trough under a hopper. The trough bends up the sides of the fabric and the hopper supplies the powder into the resulting channel or fold. The strip of fabric then passes through another part of the apparatus which folds over the edges and forms a tube enclosing the powder. This tube is then countered or bound over with yarn or twine from a number of bobbins, and a waterproof coating is applied. The yarn or twine may be wound in opposite directions if preferred, and sometimes tape may be used in place of them. In the latter case only one bobbin is required.

[Printed, 8*d*. Drawings. See Repertory of Arts, vol. 14 (*enlarged series*), p. 77; London Journal (*Newton's*), vol. 35 (*conjoined series*), p. 17; Mechanics' Magazine, vol, 51, p. 44; Patent Journal, vol. 7, p. 238.]

A.D. 1849, March 14.—N° 12,514.

CLARKE, Thomas, and MOTLEY, Thomas.—Machinery for boring and excavating.

This Specification has reference to improvements in obtaining and applying motive power, but some of its details relate also to machinery for boring and excavating.

The patentees describe an apparatus for driving piles, in which the monkey is raised by the action of atmospheric, steam, or water pressure in a cylinder. The rope is secured at one end to the monkey; it then passes over a pulley at the top of the framing, round a fixed pulley, and round one attached to the piston rod end, to the top of the pile where it is secured. The backward movement of the piston then raises the monkey. The patentees further propose to substitute for the pile a boring tool which would be similarly acted upon by a series of short quick blows. The drawing shows the boring tool to be shaped like a screw and surrounded by a cylinder for a little way. Outside the cylinder is a bucket, which may be raised to the surface and lowered as required. The rotation of the tool gradually throws the debris into the bucket for removal.

The patentees also describe an excavating machine which is a kind of steam shovel. The tool is operated by machinery in very much the same way as a man works a shovel. The earth is tilted from the shovel on to a platform, which may be made to rotate and throw it into the wagon. More than one shovel may be similarly worked in one machine.

[Printed, 4s. Drawings. See Mechanics' Magazine, vol. 51, p. 282; Patent Journal, vol. 8, p. 31.]

A.D. 1849, April 16.—N° 12,566.

PIROU, Louis Prosper Nicholas Duval.—"Improvements "in tubes, pipes," &c.

The invention consists in making pipes, &c. by placing beton or concrete (a composition of broken stones and hydraulic lime) between two surfaces of sheet iron. The pipes, "either for "gas, water, or other liquids or fluids" are made by ramming the concrete into the sheet iron moulds. The metallic tubes are left uncovered for a few inches at each end to facilitate joining. The joint is made good with some of the same substance with which they are constructed. For other purposes, such as "the construction of bridges, roads, tunnels," &c. similar applications of concrete combined with a double surface, are indicated. For instance, the inventor makes hollow "cov- "ings" of sheet iron, which when put together would form a segment of a circle of a complete tube, and which are solidly filled with the concrete. He also makes large tubes or culverts by building up concrete round an iron tube, framing being fitted to the interior of the tube to prevent distortion during the ramming.

[Printed, 8d. Drawing. See Mechanics' Magazine, vol. 51, p. 378; Patent Journal, vol. 8, p. 67.]

A.D. 1849, April 4.—N° 12,580.

GORDON, Robert.—Ventilating mines.

The upcast shaft is closed at the top, and the ascending current of air passed along culverts into the ash-pits of boiler furnaces arranged at the foot of a tall chimney. Branch culverts are also provided through which the current may be deflected into the chimney when it is not desirable to urge the fires. By another arrangement the air is passed from the bottom of the chimney into furnaces and then out again into the chimney. By this method the products of combustion maintain a continuous current up the chimney, so that more air than is necessary for the furnaces alone, is drawn up the shaft. One shaft may be divided by a brattice to serve for both up and downcast shafts. The furnaces may also be placed below ground, the chimney being constructed within the shaft, leaving a space round it for air and water passage.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 14 (*enlarged series*), p. 277; London Journal (*Newton's*), vol. 35 (*conjoined series*), p. 266; Mechanics' Magazine, vol. 51, p. 335; Patent Journal, vol. 8, p. 58; Engineers' and Architects' Journal, vol. 12, p. 372.]

A.D. 1849, June 5.—N° 12,632.

DUNN, Samuel.—"Improvements in constructing tunnels."

The invention relates to a mode of "constructing tunnels, " passages, or ways under water, such as from side to side of " rivers, channels, straits, estuaries, or other similar localities." Instead of sinking a shaft and boring or excavating thence under the river, the inventor commences "a cutting, tunnel, " covered way, or trench, at a convenient distance from the " water," and constructs it at a "proper descending angle" to the water's edge. He then adapts to the tunnel a "protecting " cylinder, shield, or submarine plough." This is "constructed in such a manner that the remaining portion of the " tunnel may be built up inside of it, bit by bit, the protecting cylinder or shield being moved onward from time to " time as the tunnel inside is built up. The tunnel is constructed of strong planking, covered on the outside with a " layer of gutta percha or some other suitable waterproof " material, and the inside of the tunnel is further lined with " sheets of strong boiler plate iron, firmly bolted together, the " whole being so constructed as accurately to fit the inside of " the cylindrical or elliptical part of the protecting cylinder " or shield, so as perfectly to prevent the entrance of any " water, and yet at the same time allow of the protecting " cylinder or shield to be advanced from time to time as the " building operation inside proceeds." The shield is forced " forward by hydraulic power, "or any suitable mechanical " means, so as to cause the front part of the shield," which is shaped like a ploughshare, "to upheave and force forward, or " on one side, any superincumbent or surrounding sand" or other resisting medium.

[Printed, 1*s*. Drawings. See Mechanics' Magazine, vol. 51, p. 547; Patent Journal, vol. 8, p. 141.]

A.D. 1849, August 23.—N° 12,746.

COWPER, Charles.—(*A communication.*)—Raising and lowering in mines.

For this purpose the inventor employs two pairs of spears, which rise and fall with a stroke of about fifty feet in the shaft. The spears in each pair are linked by a chain passing over a wheel at the top of the shaft. One pair of spears moves in one direction the other pair in another. Cross beams are fitted to the spears and provided with catches for holding the boxes. Guides for both spears and boxes are provided, and also fixed stages at proper intervals in the shaft. At each lift of a spear a box is raised by a catch on the spear and deposited on the next stage above. The spear then descends for another box, the catch above meeting the first box and raising it at the next lift, to yet another stage and so on. Thus, each lift of the spear deposits a box at the bank. The descent of the boxes is accomplished similarly but in a reverse manner, the catches of course being different. A platform oscillating between the ascending and descending spears at the pit's mouth is provided to receive the boxes. This platform is worked or swung into and out of position as required by means of levers and tappets actuated by the spears and boxes.

Men may be taken up and down in the boxes, but steps or platforms may also be fitted to the spears in the usual manner. Water also may be raised or pumps worked by means of the spears.

By another arrangement pivotted platforms are fitted in the spears and furnished with rails upon which the carriages or boxes may run. These balanced or pivotted platforms are inclined either way by tappets at proper moments, so that the carriages may run off from one to the other.

The spears are worked in various ways. When a steam engine is used it is reversed at intervals, and automatic apparatus for this purpose is provided, by which the steam is gradually shut off as the spears approach the end of their stroke, and is gradually admitted to drive the engine the reverse way. The spears may also be hung from pistons working in long cylinders placed over the shaft, which pistons are to be worked by water pumped in by the engine, the length of stroke being obtained by proportioning the sizes of the plungers of the pumps and the pistons of the long cylinders. Where there is sufficient fall of water, it may be conducted directly to the long cylinders, proper valve gear being provided.

[Printed, 2*s.* 4*d.* Drawings. See Mechanics' Magazine, vol. 52, p. 179; Patent Journal, vol. 8, p. 257.]

A.D. 1849, November 6.—N° 12,834.

NEWTON, William Edward.—(*A communication.*)—Machinery for boring rock, &c.

The boring tool in this machine is operated similarly to the monkey of a pile driver. It is suspended by a clip and a rope passing over a pulley at the top of the framing. The rope passes round a drum, on the axis of which are friction pulleys which, by means of a treadle may be brought against other friction pulleys on the driving shaft. Thus when the attendant presses on the treadle, the drum winds up the rope and raises the tool till the clip comes against a stop and is released, allowing the tool to fall. The tool may be rotated after each stroke by an attendant. Next the weight of the clip brings down the rope and catches the top of the tool, when a pressure of the foot repeats the operation. If however the weight of the tool be sufficient, the drum will be kept in gear without the aid of the treadle, and the moment it is released the drum will fall out of gear by its own gravity. By a modification, dispensing with the friction pulleys, the drum is so constructed, that the rope is wound on it till it completes its revolution, and comes in contact with a wedge piece, by which it is raised and suddenly forced off the drum. The borer is then of course free to descend by its own weight.

[Printed, 1*s.* 2*d.* Drawing. See London Journal (*Newton's*), vol. 37 (*conjoined series*), p. 243; Mechanics' Magazine, vol. 52, p. 379; Engineers' and Architects' Journal, vol. 14, p. 7; Patent Journal, vol. 9, p. 53.]

A.D. 1850, January 19.—N° 12,936.

SIMPSON, George.—Raising and lowering in mines, &c.

A water tank is placed in the shaft and extends from top to bottom. It is surrounded by a number of annular tanks or reservoirs one above the other, each reservoir being valved. The load is placed on a buoyant piston or float at the bottom of the tank, and the water in the lowest reservoir allowed to flow into the tank. The load is thus lifted to the level of the next reservoir and opens the valve. The water from this reservoir then flows in and lifts the load to the level of the next reservoir, and so on to the top. To take down the empty float, the water in the tank is suffered to flow back into each reservoir in succession from the top, the descending float closing the valves. Thus the load is raised with the loss only of the contents of one reservoir.

By another mode the load is supported on a float under an air chamber or bell which floats to the top of a filled tank. The float and load are prepared in a water-tight chamber under the tank, the water from which is afterwards allowed to come in and float it up.

The inventor also proposes to place in the shaft a vertical air trunk, fitted with a piston upon which the load may be placed. This piston is water-packed, and when air is pumped in underneath, it is intended to raise the load to the top.

[Printed 2*s.* 4*d.* Drawings. See Mechanics' Magazine, vol. 53, p. 76; Practical Mechanics' Journal, vol. 2, pp. 241 & 271; Patent Journal, vol. 9, p. 200.]

A.D. 1850, October 6.—N° 13,215.

MELVILLE, Alexander, and CALLOW, Edward.—Explosive compound and mining cartridges.

The explosive compound for blasting, &c. is composed of "two parts of chlorate or oxymuriate of potash, and one part "of orpiment or red sulphuret of arsenic," or in another form of "five parts of chlorate of potash, one part of prussiate or "ferrocyanate of potash, and two parts of orpiment." Another compound is made up of "one part of chlorate of potash and "one part of prussiate of potash." These substances are to be finely powdered and ultimately mixed.

These compounds may be moulded in a damp state by means of a tube having inside it a projection which leaves in the moulded mass a chamber or cavity for the reception of the fuse. The charge is removed from the mould and placed in the ordinary case. The cartridge may also be charged partly with dry materials in powder, "and the case stopped at the "top in the usual manner, or a solid piece of the compound "may be used and placed at the top for that purpose."

[Printed, 1*s.* 6*d.* Drawings. See Mechanics' Magazine, vol. 54, p. 134.]

A.D. 1850, November 14.—Nº 13,344.

LIEBHABER, JOSEPH CONRAD Baron.—Preparing rocks for blasting.

This invention relates to improvements upon those described in the Specification of the inventor's Patent of March 1845, (No. 10,579).

Various arrangements of tubing are shown, by means of which the acid is to be conveyed to the chambers in the rock, and through which the products of decomposition are to be passed out. The withdrawal of these products is to be facilitated if necessary by connecting the tube with a vacuum apparatus. The tubes and vessels are also to be made of gutta percha, so as not to be acted upon so readily by the acids as metallic tubes.

In order to ascertain the capacity of the cavity so prepared, a mixture of sawdust and powder is to be inserted, there being only sufficient powder to "ignite the sawdust and to blow it " out. Then by knowing how much of this mixture has been " introduced into a cavity," "the workman will know the " quantity of powder required to fill the hole."

[Printed, 1*s*. Drawings. See Repertory of Arts, vol. 18 (*enlarged series*), p. 15; Mechanics' Magazine, vol. 54, p. 415; Patent Journal, vol. 11, p. 184.]

A.D. 1851, January 30.—Nº 13,478.

KIND, CHARLES GOTTHELF, and DE WENDEL, CHARLES ALEXIS.—Machinery for boring rock, sinking and lining shafts.

This machinery is so constructed that when the boring tool has reached the limit of its stroke, a pair of forked rods, constituting a kind of framing slides down the bar carrying the tool. This frame also carries a clip for lifting the tool, and above it a disc or piston, packed with leather, which fits the bore hole. By the downward movement of the frame and disc, the water contained in the hole will drive up the disc and so open the clip or tongs to take hold of the head of the tool. " When, on the contrary, the apparatus is raised, the disc " being pushed back by the water" will "close the lower part " of the tongs, which will take hold of the head of the tool " and raise it." "When the apparatus has done working " upwards, and when it is again about to descend, the tool, " which retains a slightly ascending movement from the " momentum it had acquired, and the disc being retained by

" the water, the head will be detached from the tongs by the " opening of the latter, and the tool will fall without touching " them."

The upper part of the boring tool is provided with cutters which serve "to shape and equalize the aperture," and to " prevent the tool from deviating from a vertical position." They are so fitted that they may be kept closed while the tool is being lowered through the tubing, but open out to work when they come into position. On being withdrawn, the blades will close by their upper rounded parts coming in contact with the tubing, into the interior of which they will then enter easily.

Apparatus is also provided for bringing up specimens of the strata through which the boring is progressing. A large cutter is also provided for sinking wells or shafts of large diameter. It carries a number of teeth or chisels, and segmental pieces to cut and round the circumference of the shaft. There is also a "small borer" for making the first bore in certain cases, and also a "scraper" for cleansing the bore.

The patentees further describe a means of lining wells or shafts with iron or timber before the boring is complete, and without its being necessary to draw off the water. Cylinders are sunk one above the other, and the space between them and the sides of the shaft filled in with mortar or cement. A water-tight platform is built across the lower cylinder, and being fitted with a pump and valves the cylinders in descending are supported by the water, and descend slowly by their own gravity. If the resistance of the water be too great to allow them to descend, the valve is opened and the water allowed to rise and flow over to such an extent as to allow the cylinders to descend.

[Printed, 2*s*. Drawings. See Mechanics' Magazine, vol. 55, p. 118; Patent Journal, vol. 11, p. 229.]

A.D. 1851, September 25.—N° 13,754.

ROBERTS, Robert.—Quarrying.

This invention consists in a method of quarrying slate and other rock of a lamellated nature. It is intended to obviate the waste that occurs in blasting. A cut is made at right angles to the line of cleavage by means of various tools, and the table of slate is then raised by driving in wedges at the plane of cleavage. The cut is made by working a row of holes, or a groove may be cut by a machine for the purpose, in which a cutting tool is propelled in a line by screw apparatus, while it is at the same time raised and depressed by a hand lever. For making holes a guide apparatus is provided. This consists of parallel plates of iron which have holes corresponding with each other, through which the tool is worked.

Various patterns of tools are shown. Those for breaking away the spaces between holes already bored, are furnished with barbs or flanges at the sides. For boring holes a jumper is preferred, having the "ends formed with edges inclined in " opposite directions."

[Printed, 1s. 8d. Drawings. See Mechanics' Magazine, vol. 56, p. 279.]

A.D. 1852, March 8.—N° 14,014.

PIDDING, William.—Apparatus, &c. for boring and blasting rock.

The drill is made in two parts in such a manner that as the point comes against the rock the sides of the drill are forced outwards and thus widen the hole. The whole apparatus is to be protected from dirt by india-rubber or other suitable substance.

The patentee proposes to facilitate boring by applying highly heated objects "against or into the quartz or other " earth," and after allowing them to remain there a little time to substitute a cold object, upon which "the quartz or other " earth" will "crack in all directions." For the heating purposes instruments made of alumina and silicate of magnesia may be used, or a galvanic current. Further, the rock may be fused by various means, such as electricity or pyrotechnic compositions, and the melted rock removed by an exhaust or otherwise; or fluoric acid may be employed to make holes.

Water may be decomposed by an electric current, and the gases fired, by which operation the rock is to be blasted. A mixture of charcoal or coke, chlorate of potash, phosphorus, and sulphur, may also be used as a blasting agent.

[Printed, 8d. Drawing. See Mechanics' Magazine, vol. 57, p. 239.]

A.D. 1852, April 15.—N° 14,065.

DAVEY, Simon, and CHANU, Adolphe Ludovic.—Explosive compounds and mining fuses.

Two compounds are described, namely, (1) consisting of "six parts of chlorate of potash, five parts of nitrate of potash, five parts of sulphur of antimony, two parts of yellow "prussiate of potash, and two parts of bichromate of potash;" (2) consisting of "six parts of chlorate of potash, three parts "nitrate of potash, three parts sulphuret of antimony, and "four parts of prussiate of potash." These ingredients are carefully ground and thoroughly mixed.

The improvement in the fuses consists in the substitution of a thread saturated with an explosive composition for the usual train of powder woven into the strands of the fuse. For slow burning fuses the threads are merely saturated with ordinary powder ground into a paste with gum water. For quick burning fuses one of the above compositions is similarly used. An apparatus for passing the threads through the composition is described by the inventors.

For firing explosive compounds, the inventors make use of a small brass cap or short tube, filled with some explosive compound and fitted on to the end of the length of fuse. The latter is then surrounded for some distance with a "guard "tube," to prevent the sparks from the fuse igniting the charge before the fuse burns down to the cap.

[Printed, 8*d*. Drawing. See Mechanics' Magazine, vol. 57, p. 335.]

A.D. 1852, June 12.—N° 14,165.

DIXON, Edwyn John Jeffrey, and DODSON, Arthur John.—Quarrying and sinking machinery, &c.

When it is required to sink a shaft or well, the inventors place on the spot a turntable somewhat smaller in diameter than the intended shaft. A drill or jumper is combined with the turntable, and works outside its periphery. The turntable is rotated by means of a pinion taking into a racked circular racer. The pinion has only a few teeth, so that the rotation only takes place at regular intervals, and while the jumper is rising. The power rotates the turntable and works the tool at the same time. Thus a circular groove is cut, leaving a core, which is afterwards removed by blasting. A steam engine may be fitted on the table, so that in sinking a deep shaft the power will follow the work.

The inventors have also made some improvements in the "American stone drill." The improvements consist in providing a kind of ladder upon which the jumper bar may be raised to its place in the machine, and in an alteration in the cams, by which the necessity for lifting and passing the bar through the cams is obviated. The face of the cams is removable to allow the bar to fall into its place. The drill bar is to be scarfed to the cutting bit, and iron hoops or rings driven on tight, instead of making the joint by spill and socket and cross key.

For cutting "foot and other joints" a machine is used in in which a row of drills or jumpers are moved horizontally, and at the same time individually rotated by pinions, while a number of hammers worked by toothed sectors drive them into the rock. This machine may be used for cutting grooves perpendicularly, but in this case the hammers are dispensed with, the weight of the tools being sufficient.

The Specification also relates to machinery for dressing and manufacturing slate, &c.

[Printed, 4s. 6*d*. Drawings. See Mechanics' Magazine, vol. 57, p. 516.]

PATENT LAW AMENDMENT ACT, 1852.

1852.

A.D. 1852, October 1.—N° 42.

HEDLEY, OSWALD DODD.—"Getting coal and other minerals."

The invention consists in "applying a cutting tool or ex-
" cavating bar to and projecting from the side of a carriage
" running on a railway, so that the cutter may be caused to
" pass more and more deeply into the side of the mine by the
" repeated passing of the carriage, and setting of the tool more
" and more beyond the side of the carriage."

"This invention is well adapted for excavating in coal mines,
" coal strata, fire clay, iron mines, and in quarries of chalk,
" and in mining for or obtaining pyrites."

[Printed, 6*d*. Drawing.]

A.D. 1852, October 5.—N° 228.

NEWTON, William Edward.—(*A communication.*)—"Im-" provements in machinery for boring or cutting rocks, or other " hard substances, for the purpose of tunnelling through " mountains, or making other excavations."

This invention consists "in employing one or more metal " rollers, or one or more sets of rollers or rotating discs, with " their peripheries or cutting edges properly adapted, to cut " away the surface of the stone by rolling against it; in doing " which they shall describe in their action a segment of a " circle from the centre to the circumference of the tunnel or " other perforations to be made, in combination with a slow " motion around the said centre of the tunnel or other aperture, " whether the two motions be continuous, intermittent, or re-" ciprocating, whilst at the same time the entire machine, or " that portion of it which carries the rollers or rotating disc is " capable of being moved forward or advanced in the direction " of the axis of the tunnel or other aperture that is being cut, " in order to keep the cutters to their work as the face of the " stone is cut away by the operations of the machine."

[Printed, 8*d.* Drawing.]

A.D. 1852, October 6.—N° 268.

CROSSBY, William. — (*Provisional protection only.*) — Ventilating mines, &c.

A main pipe, furnished with branches extending into the workings of the mine, is connected with the axis of a fan, by means of which the foul air is withdrawn from the mine and expelled through another pipe at the periphery of the fan. To send in fresh air the same fan may be used, there being added similar pipes for bringing in the air by the axis, and discharging it into the mine by the periphery, but of course the two pipes first mentioned are closed by valves. Or a second fan may be used if preferred.

[Printed, 4*d.* No Drawings.]

A.D. 1852, October 12.—N° 344.

PERKES, Samuel.—Boring earth.

The part of the invention which relates to boring earth consists "of a new description of boring bar, which" is made

" of jointed hollow cylindrical iron tubes, so as to admit water " down the centre, if required, to the chisel point or cutter " when in operation for facilitating its progress. The joints" consist "either of sockets and gibs, or cotters or screws, or " combined and constructed in convenient lengths." There is constructed "a working guide cylinder at the top, having a " bevilled flanged rim, and receiving pan or vessel round the " same, and a vulcanised india-rubber drip collar to conduct " thereto the particles of mineral or other matter which may " be worked up from the bore for inspection. Also, at the " bottom of the said bar," there is constructed "a cylindrical " boxed valve of any convenient length, in order to secure " and retain if required the mineral or earthy particles from " any required depth, which can be extracted as often as the " operator may wish for actual examination. This bar" is also provided "with a chisel pointed cutter at the extremity, " and the same" is worked "on the churning principle over a " pulley or spring lever, or otherwise as may be required."

The invention also relates to washing, dressing, and amalgamating ores.

[Printed, 1*s*. Drawing and Woodcuts.]

A.D. 1852, October 12.—N° 346.

PERKES, Samuel.—"Certain improvements in mines, build- " ings, and sewerage, for effecting sanitary purposes, and " treating the produce therefrom."

The inventor proposes to ventilate "mines" by laying a conduit or main in the galleries. This main has a number of openings to allow ingress of the vitiated air, and it terminates above ground in a furnace or is fitted with a centrifugal exhausting fan. He also sprinkles about a "solution of lime" to correct the air in the "mine."

A portion of the Specification is taken up with a description of improvements in warming and heating buildings, and other points not comprised within this series of Abridgments.

The inventor proposes to form "a complete main sub-sewer " or sewers below the lowest part of the lowest sewer as now in " use," and into this all the existing sewers would discharge. In order not to interfere with traffic, he proposes to drive a tunnel through the ground and line it as he proceeds with cast-iron segments. These segments are fitted with rails about half way up, so that carriages may run upon them above the level of the sewage. These carriages are to be used when inspecting the sewer, or to carry a system of rotating paddles to cleanse it. The sewer is to be ventilated by high shafts of brick or stone or iron. The sewage is to be received in a tank whence it is to be raised to the surface by pumping or in short lifts by means of rotating paddles worked by steam engines. A process of utilising the sewage matter is described.

[Printed, 8*d*. No Drawings.]

A.D. 1852, October 15.—N° 407.

WARING, CHARLES HENRY.—Cutting and working or quarrying coal, stone, &c.

Various patterns of machines for the above purpose are described in this Specification. They are divided into two classes, rotary cutters and reciprocating cutters. In one of the former, cutter wheels or discs provided with bird-mouth or angular cutters on their peripheries, are caused to rotate by means of crown or cogged wheels, set in motion by the power of men applied through levers and cranks. In some cases teeth or cogs are formed in the intervals of the cutters on the peripheries of the cutter discs, and the cogged wheels which drive these discs have intervals here and there to escape the cutters. In others, such as the horizontal cutter machine, a ring of apertures is made in the disc, into which the teeth of a vertical wheel engage. The machine keeps itself up to the work by means of screws and ratchets, or ropes, or cogged rails and pinions may be used. In another machine the cutter disc is supported by an arm which works in a species of ball-and-socket joint, and so is capable of being moved at any required angle to make a cut. In order to produce a cut of greater height than the diameter of the wheel or cutter disc, a machine is contrived in which the disc is carried at the end of a lever or radial arm. Its action is as follows:—The lever is raised as high as its quadrant will allow, and the disc rotated until it has buried itself in the coal. The lever is then released, and the disc in cutting descends and makes a long vertical cut.

The reciprocating machines have a general similarity. They consist of cutter bars held in cutter frames which slide horizontally in other frames, to which vertical motion is given by a crank. This latter frame slides on bars screwed up in the working. The horizontal motion is given by screw gear, and is for the purpose of keeping the cutters up to the work; the vertical motion is to cut the coal. Two sets of cutters are used in two frames; one set with teeth pointing one way, the other the reverse. The whole apparatus is contrived to act in various positions, and may be worked by steam or compressed air. The cutter frames are made of two parallel plates or sides in such a way that a jet of water or stream of air may be passed into the cut to clear it out. A modification of the machine is shown in which the crank is dispensed with, and a lever used instead. The stroke of the lever may be regulated by a moveable fulcrum, and its action also works the ratchet feeding gear.

A method of quarrying stone is also described. The stone is cut in steps of the height of the blocks which are to be quarried. One rotary cutter travelling on a railway laid on the first step, cuts horizontally under the next step. Another machine, similar to that above described, with the cutter fixed in a radial arm, travels along above the step and cuts vertically behind it. Nothing then remains but to cut the rectangular prism so prepared into blocks by transverse cuts. A modification of this method is described.

It should be noted that in these machines a "determinate motion" is to be given to the cutter, and not a mere pressure.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1852, October 16.—N° 417.

PUIS, Pierre Augustin.—Chain or cable and drum for mine purposes.

"The cable is composed of two series of straight wires " fastened together by ligatures, and divided into links of " equal length corresponding to the sides of the drum, and " fastened together by means of bolts or pins, which serve as " centres to small pullies, over which passes the series of " wires. The cable passes round the drum, which revolves " either way as required; the bolts of the cable fit into " openings in the rim on the drum, which rim passes between " the two series of wires forming the links." The cable is represented as endless, passing over a drum at top and bottom of the shaft.

The drum is of polygonal form, and on its circumference "is " a thin rim, in which are openings representing the angles of " the polygon."

[Printed, 1*s*. Drawings.]

A.D. 1852, October 18. N° 423.

COTTAM, Samuel Fletcher.—" Quarrying slate."

This invention consists in the application of hydraulic power for the above purpose in place of blasting. "A groove or " recess has to be made under the block of slate to be split of " sufficient size to admit a small hydraulic press (or a row of " hydraulic presses if the slabs required are very large), and " to the rams of the hydraulic presses are attached wedges, " acting against the under edge of the block to be split."

The drawing also shows and the Specification describes, the application of the press in a horizontal position, but in this case the end of the ram abuts against the block and no wedge is used.

[Printed, 6*d*. Drawing.]

A.D. 1852, October 27.—N° 543.

NORTON, John.—" Blasting."

The inventor employs tubes or cartridges charged with " fulminating mercury or other highly explosive compound," and closed at each end with discs of wood, in each of which is fitted a percussion cap. Between the two caps is a cylindrical pin, serving as an anvil for the ignition of the caps. This cartridge is placed in the hole or drift, and a bar of metal or wood lowered carefully on to it. To fire the charge the protruding end of the bar is to be struck by a mallet or otherwise. No tamping is required, or even permissible.

[Printed, 6*d*. Drawing.]

A.D. 1852, November 8.—N° 679.

HOGA, Stanislaus.—(*Provisional protection only.*)—" As- " certaining the existence of gold in the earth." The inventor says " I make use of a rod of some conductor of electricity, " and wherever gold is supposed to exist in the earth I insert

" this rod, and the presence of that metal will be immediately " indicated by the completion of the electric circuit."

[Printed, 4*d.* No Drawings.]

A.D. 1852, November 9.—N° 698.

HEDLEY, OSWALD DODD.—Coal cutting machine.

A rotary saw or cutter is mounted horizontally on a spindle in such a manner as to be capable of vertical adjustment. This spindle is supported in a sliding frame on a carriage. The carriage runs on rails parallel with the face of the coal to be cut, the sliding frame may be adjusted transversely to the carriage and to and from the face of the coal, by which means the saw or cutter may be gradually set into the coal as the cut proceeds. The saw or cutter derives its motion, through gearing, from the motion of the carriage itself as it is drawn backwards and forwards on the railway. Thus, at each traverse of the carriage a groove is cut by the saw or cutter, and as the saw is set up by the screw the cut is deepened. Horse or manual power is employed to propel the carriage.

[Printed, 6*d.* Drawing.]

A.D. 1852, November 15.—N° 759.

ROGERS, ABRAHAM.—"Improvements in apparatus used for " forming sewers, tunnels, and ways."

This invention "consists of constructing an arched frame " composed of arched ribs of iron, on the upper surfaces of " which are applied several long metal plates covering the " arch, and which are made capable of sliding longitudinally " in a frame, so that they may be moved forward in succession " whilst the arched frame remains stationary; and it is pre- " ferred that these long plates should, at their fore ends, be " provided with cutting edges, in order that they may cut into " the earth, if desired, as they are forced forward, so that " when all the plates have been forced forward any distance, " and the arched ribs have also been moved forward, they will " offer an arched roof over the space covered thereby, and the " workman will be protected from the falling in of the earth."

[Printed, 4*d.* No Drawings.]

1853.

A.D. 1853, January 31.—N° 247.

PERKES, Samuel.—Sub-aqueous ways and tunnels.

In cases where the water is compelled to be kept in the channel, the inventor proposes to make an "excavation by " means of diving apparatuses, blastings, &c. or by means of " tubular valved plungers, to be worked or driven into the " bed of river after the manner of piles, and then withdrawn, " and their contents discharged, or with powerful boring tools " for rocky substances; these excavations to be made of " sufficient dimensions for the proposed tubes or tube re-" quired." An iron tube is then constructed of suitable proportions and floated over the excavation. It is made watertight, with portable ends attached by bolts and nuts. Valves are constructed in the tube by which water can be admitted to sink it. The tube is of length sufficient to reach as far beyond the edge of the water line as may be necessary, and to which extent the excavations must be made and the water admitted for convenience of floating and sinking the tube. This done, the embankments are filled in, the water cleared from the approaches and the road and the latter completed.

If the roadway be required to be through earthwork and not connected with rivers, then the iron-work is to be constructed in lengths or segments, if required, and properly jointed with each other. In certain cases the tube may be curved so that the top may just lie underneath the bed of any river, and by this means the entrance may be brought near the level of the adjoining streets. In this system of inverted curve railway, carriages may be sent through by their own impetus.

[Printed, 8*d*. No Drawings.]

A.D. 1853, February 3.—N° 300.

RICHARDS, William, and BECK, Edwin.—(*Provisional protection only.*)—"Exhausting and driving air through " mines," &c.

For this purpose two bells or cylinders are immersed in an annular tank of water, one bell being smaller than and within the other. This smaller bell is raised and lowered in the tank by means of a rod which passes through the outer bell, to the source of power. As the inner bell is raised air flows into it through valves, and as it falls the air passes out of it also through valves into the larger bell, whence it is expressed through a main at the next lift of the inner bell.

[Printed, 6*d*. Drawing.]

A.D. 1853, February 12.—N° 376.

PIDDING, William.—Drilling quartz, &c. previous to blasting.

The inventor proposes to make use of a tool or "rammer" fitted into a frame along which it may slide "horizontally or " on an incline or railway." The power is supplied by steam or by the explosion of gunpowder placed in a "common " cannon," into the mouth of which the end of the "rammer" fits. The "rammer" or tool is brought back for the next stroke by springs. The "rammers will be in some instances " furnished with projections or scoops, to throw the earth or " other substances sideways into vehicles, or simply side- " ways."

The invention is also claimed to be applicable to "crushing " or otherwise treating ores."

[Printed, 4*d*. No Drawings.]

A.D. 1853, March 18.—N° 672.

LUCAS, George Rock.—"Raising water and other materials " from mines."

The inventor says, "I introduce a tank or vessel under the " chain or cradle used for carrying up the minerals. In the " bottom of such tank or vessel is a valve with a rod, having " at its upper part a cross-bar, so that when the cross-bar " drops upon the rests (at the top of the shaft) it lifts the " valve and allows the water to escape. Near the upper part " of the shaft of the mine is a receiver or trough, which, when " the tank has been raised beyond it, is caused to descend into " the tank, and to receive the water to conduct it away into " the drain. When the chain is again lifted from the rests " ready to descend the shaft of the mine, the receiver or trough " falls back into the end of the drain. A reservoir is formed " at the bottom of the shaft of the mine, into which the water " is collected from the workings of the mine, the tank descends

" down into the reservoir, and the water fills the tank or vessel, " and at the same time the mineral is loaded upon the chain."

[Printed, 8*d*. Drawing.]

A.D. 1853, April 9.—N° 855.

GOBLE, George Frederic.—Raising water, &c.

The apparatus invented for this purpose consists of an endless band carrying buckets, which is caused to travel round three drums placed in a triangular position, two below in line, and one above. The bottom side of the triangle is immersed in the water to be raised, and the band is caused to pass round the drums by the action of the current or fall of water on the immersed buckets. The buckets rise, partly filled, out of the water, and are emptied on turning the apex of the triangle.

The apparatus described in the Specification is claimed to be capable of modification, to suit the circumstance under which it may be applied, and it is also claimed to be applicable " particularly in draining land or mines."

[Printed, 8*d*. Drawings.]

A.D. 1850, April 20.—N° 951.

WEIGHT, Samuel.—"Improvements in ventilating mines, " sewers or drains, ships, buildings generally, and other " localities."

The principle of the invention is described by the patentee as consisting :—"in the use and application of a rotary fly " placed within a funnel or conical-shaped cast or sheet iron " or other metal box or casing, to which are connected tubes " for exhausting and discharging the contents of a receiver" placed "near the bottom of the place to be ventilated or dis- " charged of the foul air contained therein; said receiver is " connected by suitable tubing to the box or casing in which " the rotary fly is placed, and there is other tubing connected " to said receiver, which tubing is conducted to all parts of " the place to be ventilated." When desirable several receivers connected by tubes or pipes may be employed.

[Printed, 8*d*. Drawings.]

A.D. 1853, May 16.—N° 1212.

JONES, George.—"Ventilating mines."

For this purpose the patentee makes use of an exhauster or blower, which he has previously patented as applied to purposes of gas manufacture. It consists of a chamber in which work a pair of rotary interlocking pistons, driven by pinions. This exhauster or blower may be placed at the top or bottom of the shaft as preferred, and from it pipes are conducted to the workings. It may be used as a blower or as an exhauster. In coal mines, where the works are extensive, "bye pits" would in some cases be used "for fixing the necessary apparatus, or the pumping or lifting engine shaft" could be used according to convenience, and "more than one machine might be employed."

[Printed, 8*d*. Drawing.]

A.D. 1853, June 4.—N° 1381.

BIRAM, Benjamin. — Winding apparatus and ventilating mines.

The improvement in winding machinery consists in placing two drums over the shaft, one of which is worked by a double cylinder engine by cranks placed at right angles to each other on the axis of the drum. The second drum is coupled with the first drum by coupling bars, like the driving wheels of a locomotive. The engines are fitted with link reversing gear. The advantages claimed for this arrangement are, dispensing with a fly wheel and extra pulley wheels over the pit, the facility it affords for enclosing the whole of the machinery within a moderate sized building, and making the communication with the pit mouth by two doors, one only to be open at a time, and thereby rendering a pit ventilated by a fan or other machinery available both as an upcast and drawing shaft.

The improvement in ventilating lies in the employment of a fan "with blades placed tangentially, or at an angle between "a radial and tangential direction."

[Printed, 10*d*. Drawings.]

A.D. 1853, June 20.—N° 1506.

NEWTON, William Edward.—(*A communication.*)—(*Provisional protection only.*)—Rock boring machine.

"The parts connected with the drill or borer, are mounted "in a swinging frame, so that the drill may be worked at any "angle. The impact blow of the drill is given by the force of "a spring made either of metal or caoutchouc, and the drill is

" drawn back either by the power of a small steam engine or " any other suitable motive agent. The drill must, by means " of a ratchet or other suitable mechanical contrivance, be " made to rotate on its axis as the work proceeds" in order to strike fresh parts of the rock. "Convenient means must of " course be provided for feeding forward or advancing the " drill" as the operation proceeds, "and the mechanical " means for so doing should be so arranged that the speed or " amount of the advance as well as the rotation of the drilling " tool on its axis, may be regulated at pleasure."

[Printed, 4*d*. No Drawings.]

A.D. 1853, June 30.—N° 1575.

BELLFORD, Auguste Edouard Loradoux.—(*A communication.*)—"Improvements in the construction of submarine or " subaqueous tunnels or ways."

The bottom of the river or water is first excavated to receive the lengths of tube. These are provided with flanges and grooves, in the latter being strips of india-rubber, to make water-tight joints. The sections are also fitted with guide pieces to fit them to one another. The first section, or more than one, may be lowered by any ordinary means, after which the ribs upon its upper surface form a railway for a travelling derrick, by which the other sections may be lowered. The sections are bolted together by a diver. After the work is completed the water is pumped out, the joints perfected from the inside and the tunnel completed. The outside is also covered with rubble.

[Printed, 8*d*. Drawings.]

A.D. 1853, July 13.—N° 1663.

BAKEWELL, Thomas Hill.—Ventilating mines, &c.

The apparatus consists of a central "body" or valved chamber, fitted on each side with a wing. These wings or divisions resemble pairs of large double bellows. The central diaphragm, as it were, of each wing works a number of air pumps by means of rods attached to the diaphragm by swivels, in order to allow for the curved motion of the diaphragm. These pumps communicate with the workings by means of pipes, attached by flexible couplings, to an air-tight bell or cover fitted over the shaft. Two of the divisions in the wings exhaust the air from the mine by alternate movements and force it through valves into the centre body, and thence by domes, into the outer air. The other two divisions of the wings take in fresh air and similarly force it into domes, whence it is taken by pipes into the workings. Bell shaped valves are fitted to the orifices so that as the bellows expand, there can be no back current into them. The apparatus may be used for pumping in fresh air only, or for exhausting only, if required, the arrangement of pipes being altered to suit the circumstances.

[Printed, 10*d*. Drawings.]

A.D. 1853, August 6.—N° 1840.

BELLFORD, Auguste Edouard Loradoux.—(*A communication.*)—(*Provisional protection only.*)—Lighting subways, &c.

The first part of this invention relates to the "securing of "lenses or other pieces of glass in openings in a grating of "cast-iron or other metal by means of a malleable metal pack-"ing or plastic cement in such a way as to make the packing "or cement hold the glass in place, form a water-tight joint "and prevent the contact of the glass and metal." "It con-"sists in making rebates round the openings in the grating, "which are large enough to receive the glass, with a band "of packing or cement extending all around and under or "inside it, and in making the sides of the glass and of the "rebate of such form, that when the packing or cement is in "place, the glass cannot be withdrawn."

The invention also relates to the use of "panes" or "tiles" of glass in iron frames for larger surfaces, and similarly treated.

The cement preferred by the patentee is a mixture of one part of coal tar, by weight, and two parts of sulphur. When metal packing is used lead is selected. In the latter case the glass lights are made in the form of two frustra of cones united at their bases. The rebates have parallel sides, and the lead, whether run in or cast separately, is set up when in position.

[Printed, 8*d*. Drawing.]

A.D. 1853, August 9.—N° 1854.

BRUCK, Louis Hartog.—(*Provisional protection only.*)—"Improvements in the construction of tunnels, sewers, drains, "pipes, tubes, channels, and other like conduits for hydraulic "or pneumatic purposes."

The invention consists in forming conduits, by building calcareous cement round a metal core, which is afterwards removed. If the pipes required be but small, the core may be made of thin cheap metal, and may be left in the cement.

[Printed, *4d.* No Drawings.]

A.D. 1853, August 25.—N° 1977.

AUSTIN, WILLIAM.—Blocks for building purposes.

"The invention consists of moulding or forming plastic "matters into two series of blocks, which in building go together and produce the bonding desired. The upper and "under sides of each block are parallel, and such is the case "with regard to the two ends of each block. The two sides "of each block of one series are formed with faces which are "convex, and the two sides of each block of the other series are "formed with faces which are concave; consequently, when "these blocks in building a wall are laid alternately, the convex "side of one fits the concave side or end of the neighbouring "block, and each block is formed with two holes vertically "through it, which produce vertical hollows in the wall, but "if great strength be desired, these may be filled with con"crete, and for those parts of a wall where only half thickness "is desired, the blocks are to be made of half the size."

The drawing shows a method of using these blocks in the construction of a "culvert" or "sewer," and also of their use in a "tunnel." In each case the perforations in the blocks are parallel with the axis of the sewer or tunnel.

[Printed, *6d.* Drawing.]

A.D. 1853, September 15.—N° 2143.

KRAUT, HENRY.—Tools for boring rock for blasting.

The tool described in this specification is used "for cutting "out a chamber or receiver for the gunpowder or other ex"plosive agent at the bottom of the hole or bore made by the "drift or borer commonly used for blasting. It consists of a "round bar of iron or steel fitted at its lower end with a "groove or recess for receiving a cutting chisel or blade "which projects in part over the said bar. The bar is tapered

" off on the side opposite to the groove or recess so as to form " an inclined plane, which will, when the bar is acted upon " by the hammer, cause the chisel or blade to advance and " cut into the rock." In using this tool it will not only loosen the rock, but it will also "raise or lift such substance in the " direction of the bore."

[Printed, 6*d*. Drawing.]

A.D. 1853, September 16.—N° 2157.

BARCLAY, ANDREW.—(*Provisional protection only.*)—Winding machinery.

The inventor proposes to adapt link motion valve gear to the engine, and "to add still further to the safe working of the " system, it may be contrived" "that a self-acting movement " shall come into play at the precise moment required for the " purpose of stopping or reversing the engine, in case the " engineman should be careless or absent at the proper instant. " For this purpose a tumbler is so connected with the engine " or winding mechanism that it shall be slowly wound up or " elevated to its falling centre at the time that the motion of " the engine is to be changed. Thus, as this tumbler falls " over it acts through suitable connections upon the reversing " or stopping link and effects the intended movement."

[Printed, 4*d*. No Drawings.]

A.D. 1853, October 4.—N° 2262.

PEACE, WILLIAM.—Hewing and excavating coal, &c.

"The machine consists of a frame of metal or wood, or of " a combination of both." "Upon this frame are fixed one " or more cylinders, so placed as to be capable of turning a " cranked shaft, which is also fixed by means of journals or " steps to the same frame, as is also another shaft. This latter " is capable of being turned by the former by means of mitre " or bevil wheels placed one upon each shaft. Upon the " lower end of the latter shaft is placed a wheel called the " driving wheel, having upon its periphery a groove with " suitable projections, or with the latter alone, for working " into and propelling" an endless chain or band carrying the cutters. This endless chain travels round two pulleys or wheels, one carried at each end of an arm or lever capable of adjustment in many positions, and if necessary several such arms and chains may be fitted to the one machine. The driving wheel carrying the endless chain is put in motion by the machinery and the travelling band of cutters works into the coal. The arm may also be attached to the crank shaft if desired and it must of course be provided with a similar driving wheel to that on the other shaft.

Compressed air, water, or steam may be used to work the machinery, and if the former be chosen, then the ventilation of the mine may be assisted by the escape of the compressed air after it has done its work, or while the machine is standing.

[Printed, 1*s*. Drawings.]

A.D. 1853, October 4.—N° 2264.

NORTON, John.—(*Letters Patent void for want of Final Specification.*)—Firing blasting and other charges.

Two pieces of cord are slightly attached together and the joint is cemented with a composition capable of igniting by friction, such, for instance, as that with which lucifer matches are tipped. When such a joint is broken by pulling the cord, the charge in which the joint is placed, is fired.

[Printed, 4*d*. No Drawings.]

A.D. 1853, November 22.—N° 2714.

LEVICK, Frederick, and FIELDHOUSE, Joshua.—Winding machinery.

" A strong framing is constructed over the shaft of a colliery " or mine " to carry the drums, " and it is preferred that such " framing should be in connection with and be part of the " framing for the engine when a steam engine is employed. " The drum or drums used for winding on and off the chains " or ropes, in place of being at a distance from the shaft, are " placed immediately over the shaft, so that the ropes or " chains may be held correctly over the shaft by the periphery " of the drum or drums used. It is preferred to use two " drums geared together, so that one may be winding on " whilst the other is unwinding; but where desired one drum " only may be used. The periphery of each drum employed " is made with two worms or grooves on the surface, the two " worms or grooves inclining across the axis of the drum in

" opposite directions, and with each drum two chains or ropes
" are used, and they are wound on to the periphery of the
" drum and into the grooves or worms by which the successive
" coils are kept apart. The drums are of such diameter as
" not to require more than one layer of rope or chain when
" all is wound up."

The two ropes or chains are fastened at the edges of the periphery of the drum, so that in winding they approach each other. The other ends meet under a pulley attached to the cross head of the cage.

[Printed, 1*s*. Drawings.]

A.D. 1853, December 3.—N° 2814.

ROGERS, Abraham.—(*Provisional protection only.*)—"Im-
" provements in ventilating sewers, mines, or other sub-
" terranean works."

The patentee proposes to connect the sewers with coke ovens or gas-making apparatus, and so draw the foul air through the fire.

[Printed, 4*d*. No Drawings.]

A.D. 1853, December 8.—N° 2854.

NEWTON, William Edward.—(*A communication.*)—Drilling and boring rocks.

In this machine the boring tool is carried on a swinging frame, which is supported by a pair of trunnions on a suitable carriage, and upon which it is capable of being elevated or depressed as required. The boring tool is pushed back by a cam on a shaft working through the trunnions, and the forward blow is struck by the elastic force of a spring of india-rubber, which is compressed by the tool as the latter is forced back by the cam. Sometimes a steam engine in the swinging frame may be employed to work the drill, or simply to draw it back. The crosshead to which the drill is attached has a reciprocating and progressively advancing motion communicated to it. The drill is also partly rotated at each stroke by means of ratchet gear and inclined planes; and by means of a sliding rod, the rate of rotation and the rate of advance of the drill are changed by one movement.

[Printed, 1*s*. Drawings.]

A.D. 1853, December 15.—N° 2910.

BELLFORD, Auguste Edouard Loradoux.—(*A communication.*)—Blasting powder.

To manufacture one hundred pounds of this powder, nineteen and a half pounds of prepared charcoal, sixty-eight pounds of saltpetre and twelve and a half pounds of sulphur are ground together, pressed and granulated. A saturated solution of chlorate of potash is then sprinkled over the powder "stir-
" ring till the powder is moistened to such a degree that the
" grains will have a slight tendency to adhere to each other,
" but not sufficiently to cause all the grains to resolve into a
" mass." The powder is then dried at a temperature of 100 deg. Fahrenheit.

The object of the cholorate of potash is to supply oxygen to the burning powder, with the view to its more rapid combustion and to the evolution of carbonic acid rather than carbonic oxide.

[Printed, 4*d*. No Drawings.]

A.D. 1853, December 30.—N° 3027.

MARLOR, Joseph.—Cages for mines and improvements in ventilating.

Within the shaft is fixed a tube, constructed of cast iron or timber and air-tight at the sides. Within this tube a cage is employed, in the crown of which are fitted valves. Some of these valves are in the top of the cage and open inwards, others are placed round the edges and are so contrived as to be forced outwards against the sides of the tube by the pressure of the air under the descending cage. When the cage is being drawn up, the valves are all open and there is no friction against the sides of the tube. An air-tight door is fitted near the bottom of the tube, through which the cage is reached, and near to it is an injection valve to supply the tube with air under the ascending cage, if it should be necessary, and another valve is also fitted to allow the air under the descending cage to be forced into the mine. A safety valve, communicating with the top of the shaft by a rod, is also provided. In case the rope should break it is expected that the pressure of air under the cage would prevent its too rapid descent. The air expelled into the mine at each descent of the cage will be an addition to that supplied by other ventilating contrivances.

[Printed, 8*d*. Drawing.]

1854.

A.D. 1854, March 2.—N° 511.

BARCLAY, Andrew—Winding machinery.

With the view to facilitate reversing and to provide safety apparatus, the patentee applies link motion gear to the engine used for winding. This valve gear can be worked by hand in the usual way, but to provide against accidents through overwinding, the main shaft is caused to put in motion, through gearing, a slowly revolving stop which acts upon the reversing lever automatically at the proper moment. This stop is capable of such adjustment as may be required; or it may be thrown out of gear altogether. The valve gear may also be stopped and reversed by means of a "weighted tumbler, which is slowly "raised or turned over by the engine itself, and on descending "acts upon the reversing lever." As additional safeguard, a friction brake is also provided, which may be worked by hand as well as by the two cages as they arrive at their proper height. The cage is also provided with one or a couple of pulleys, "contrived to be adjusted by spring pressure on the pit slides "or timber guides." The pulleys carry ratchet pinions with which catches from clipping detents for binding upon the pit slides are made to gear. While the cage is ascending the pulleys revolve freely on the slide, or are kept from touching it by the strain on the rope, but should the rope break, the pulleys begin to turn in the reverse direction and the ratchets then pull the detent pieces and clip the slide, the pulleys being also at the same time more tightly compressed on the slide.

[Printed, 1*s*. Drawings.]

A.D. 1854, March 10.—N° 573.

PEACE, William.—Indicating supply of air to mines.

This instrument consists of a balanced beam; to one extremity is suspended a disc or cone in such a position in the shaft that the current of air may act freely upon it; to the other extremity is attached a sufficient balance weight. This beam acts by means of a pinion, on a smaller pinion carrying a pointer which indicates on a dial the amount of depression of the cone or disc and the consequent velocity and volume of the current of air passing down the shaft. A weighted lever is fitted to the balanced lever in order to bring the pointer to zero, when the disc or cone is unaffected.

The instrument may be adapted to measure liquids, or to act as a governor for steam engines.

[Printed, 8*d.* Drawing.]

A.D. 1854, April 6.—N° 797.

YULE, JOHN.—(*Provisional protection only.*)—Winding machinery.

One pit head pulley only is used, the rope being passed over it in such a manner that a cage may be attached to each end. One cage rises as the other falls. A counterbalance is provided to take up the weight of the length of rope attached to the cage at the bottom of the shaft. There is also "a small rope or " chain down the pit attached to the eccentric rod, or to the " throttle valve, and also one to a powerful brake on the fly " wheel shaft, which is the axle of the pulley, these attach- " ments to be at the command of any party in the cage going " down or coming up the pit, and also at the command of the " people at the bottom and at the top of the pit."

[Printed, 4*d.* No Drawings.]

A.D. 1854, April 20.—N° 912.

JONES, GEORGE.—Landing apparatus for mines.

"A square frame is erected around the mouth of a pit or " shaft, to which frame are attached two lids or doors, which " are connected by two cranks and a rod or rods. These parts " are put in action by a lever, which may be either worked by " hand or machinery; the motion of the lever causes the lids " or doors simultaneously to open or shut over the pit's mouth, " as may be required."

[Printed, 10d. Drawing.]

A.D. 1854, May 8.—N° 1031.

LEMIELLE, Theodore.—Ventilating mines, &c.

"This apparatus consists principally of an hexagonal or other " shaped drum, provided with a number of wings or shutters, " which are hinged on the periphery thereof, and connected to " a separate shaft; that is, one end of the wings is attached to " the drum, and the other ends, by means of rods, are con- " nected to this separate shaft. The drum shaft and the wing " shaft are mounted excentrically to each other, so that as the " shaft which carries the hexagonal or other" drum or cylinder " is made to rotate, it will carry with it the moveable wings, " shutters, or fan blades; and during this rotation the rods of " the eccentric shaft will act upon the wings or fan blades, " and cause them to open and act upon and drive forward the " air that enters between the wings or fan blades and the peri- " phery of the drum. The blower is so mounted as to leave a " much wider space at the side from which the air is to be " expelled than at the other." "On rotary motion being " communicated to the main shaft, the wings or blades will " (by the action of the arms attached to the eccentric shaft) " be closed on entering the narrow space at that side where " they are not required to act upon the air, and will be caused " gradually to open on approaching that side from whence the " air is to be expelled; they will then be opened to their full " extent, and offer sufficient resistance to drive forward the air. " The action of the wings or fan blades is so timed that one of " them shall not quit that portion of the casing where the " action upon the air takes place until the one following it has " entered; thus ensuring a continuous action."

[Printed, 8*d*. Drawing.]

A.D. 1854, May 18.—N° 1103.

WORTHINGTON, Jonathan, and **ALLMAN**, Fennell.—Boring rock, &c.

The drills are to be worked by reciprocating or rotary motion instead of by strokes or blows. They may be of various shapes and are made of iron with steel lamina brazed or welded on to them. The iron wears faster than the steel so that the latter is always "proud" and so maintains a cutting edge. One drill is described as cross-shaped in section. A double brace may be used for working the tool, the thrust being maintained by a screw against some part of the working. Steam or other power may be substituted for manual power, the power being communicated through lengths of light shafting. If the engine be placed under the shaft it may facilitate ventilation.

The inventors also claim a rotary cylinder saw for cutting out coal, &c. It resembles a tube or cylinder of steel with a serrated edge.

[Printed, 4*d*. Woodcuts.]

A.D. 1854, May 31.—N° 1207.

ROGERS, Abraham.—(*Provisional protection only.*)—"Im-
" provements in the mode of ventilating mines, sewers, and
" other subterranean works; likewise for the warming and
" ventilating of all kinds of public buildings."

The inventor simply claims the method of ventilating by connecting the place to be ventilated with a shaft or chimney, which shaft is also in connection with coke ovens or other heat producers.

[Printed, 4*d*. No Drawings.]

A.D. 1854, September 9.—N° 1971.

HACKWORTH, John Wesley.—Reversing winding gear.

This invention relates to steam engines and the gearing connected therewith, but a portion has special reference to reversing winding machinery.

"In this arrangement the engine shaft is disposed at right
" angles with the winding or second motion shaft; the latter
" has upon its projecting end a large bevil wheel.

"The engine shaft carries two loose bevil pinions, contrived
" to gear with the intermediate bevil wheel at pleasure. A
" cone clutch or friction box is placed on the engine shaft be-
" tween the two pinions, so as to put the proper pinion into
" action at pleasure."

"A similar result may be obtained by the aid of a combina-
" tion of four spur pinions and a spur wheel, the engine shaft
" being disposed in a line parallel with the winding or reverse
" action shaft, and also parallel with a third or counter shaft.
" Thus, by shifting the clutch either to one side or other,
" either a pinion on the engine shaft may be made to gear
" directly with the wheel on the winding shaft, or the other

" pinion on the engine shaft may drive the counter shaft, a " pinion on the latter shaft driving the winding shaft in a " reverse direction."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1854, September 11.—N° 1978.

NORTON, John.—Ropes for mines, &c.

The several strands of which these ropes are composed, are laid side by side, in parallel lines, and are then "cemented or " connected together into one mass by the aid of a solution of " gutta-percha, or of a composition wherein gutta-percha forms " an ingredient; or other suitable cementing material may be " used." The ropes may be other than flat, and for other than mining purposes, a slight twist is considered advisable.

"As the strands of such ropes or cordage are not positively " held together by stitching, or by other directly binding " means, the tensile strain upon the individual strands when " the rope or cord is put to use is equal and regular."

[Printed, 4*d*. No Drawings.]

A.D. 1854, October 6.—N° 2149.

SMITH, Andrew.—Safety cage.

The inventor prefers to use strained wire ropes as guides for the cage in the shaft, but iron rods may be used. The cage is hung in such a manner that on the breaking of the rope, a pair of elastic lanyards, each acting by an internal spiral spring, contract and pull down a pair of levers from an inclined to a horizontal position thereby causing the ends of the latter to press against or jam the guide ropes or rods, thus stopping further descent of the cage.

[Printed, 6*d*. Drawing.]

A.D. 1854, October 19.—N° 2240.

HIGGINS, Thomas. — (*Provisional protection only.*) — Ventilating mines.

"This invention consists of two circular tubes or pipes, in " which are placed shafts with screws formed upon them, so as " to fill the space within the pipes, or nearly so. The screw " shafts are mounted upon suitable bearings, and are each " provided at the upper end with a fan turncap, which is acted

" upon by the wind, and which gives motion to the screw " shafts. One of the screw shafts rotates so as to carry a " current of air down the pipe, and the other, travelling in a " reverse direction, will cause a current to travel up the pipe." One supplies fresh air to the mine, the other draws out that which is vitiated.

[Printed, 4*d.* No Drawings.]

A.D. 1854, October 25.—Nº 2275.

MATHER, Colin.—Machinery for boring in the earth and for driving in tubes.

In this machinery the boring tool is suspended to a rope passed over the top of a frame like a pile driver. The other end of the rope is wound on a drum and is payed out as the boring becomes deeper. In working the machine, the rope is allowed to unwind till the cutter reaches the bottom of the hole. The rope is then clamped to prevent further unwinding and the piston rod of a cylinder having a pulley wheel at its end, is caused to reciprocate by tappet gear in order to take up the slack of the rope and let it go alternately in order to raise the tool and allow it to fall to the bottom again. The rope is payed out as required. The cutters are arranged in a circle in the tool with other cutters in the centre, and the tool is rotated by means of a twisted bar passing through a socket by which it is compelled to make a partial revolution, and so puts a corresponding twist in the rope. The rope, when the weight of the boring head comes upon it, has a tendency to straighten itself again and so causes the head to revolve.

After repeated action of the cutters they are lifted out by winding up the rope, the clamping being released, and detached from the rope. A lifting cylinder or bucket is then attached, and by repeatedly raising and lowering it, it will be filled with water and fragments through its valved bottom, and may then be lifted out. When there is no natural flow of water the deficiency should be supplied.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1854, November 16.—Nº 2433.

LOW, William.—Ventilating mines.

The invention consists in using steam heating apparatus in the shafts of mines in place of the usual ventilating furnaces.

Steam is conducted through pipes, forming as it were a lining to the shaft. The inventor prefers to arrange his pipes in two rings, one above the other, and connected by a number of vertical pipes of smaller diameter. Means are provided for removing the condensed steam.

[Printed, 4*d.* No Drawings.]

A.D. 1854, December 21.—N° 2695.

SMITH, Andrew, and MACKENZIE, James Thompson.—(*Provisional protection only.*)—High-pressure steam for blasting, &c.

Water in strong iron generators or vessels is exposed to a high temperature in baths of molten metal, such as lead, tin, or their alloys. The water is thus converted into steam of very high pressure which may be used, among other purposes, for "blasting rock."

[Printed, 4*d.* No Drawings.]

1855.

A.D. 1855, January 30.—N° 229.

FONTAINEMOREAU, Peter Armand le Comte de.—(*A communication.*)—(*Provisional protection not allowed.*)—"Improved machine for drilling and boring rock, for tun-" nelling and rock excavation generally."

"The inventor proposes by this machine to supersede the " ordinary mode of drilling rock by manual labour, and to " materially diminish the cost, and increase the speed at which " drilling in rock may be accomplished. The invention " consists :—

"1stly, in the use of compressed air in the cylinder for " giving an effective blow to the drill.

"2ndly, in the arrangement of the escape valves and inlet " apertures.

"3rdly, in the arrangement of machinery for giving the for-" ward and rotary motions to the drill."

[Printed, 4*d.* No Drawings.]

A.D. 1855, February 15.—N° 346.

DELABARRE, CHRISTOPHE FRANÇOIS.—"Ventilating mines" and "subterranean places," &c.

The invention consists in the use of a "mixture of steam and " air or other gases, instead of the apparatus now in use for " the same purpose, the mixture being obtained and applied" " by projecting a relatively small and more or less compressed " current of steam or other attracting fluid into a large single " or multiple recipient pipe or channel, so as to give access to " and cause the attraction of a considerable mass of air to be " carried along with the steam."

The jet or cone of steam thrown into a larger pipe or recipient draws after it a quantity of air, "thus forming a mixed gas." This may be discharged into a still larger pipe, and will spread up to the side of this latter pipe and so draw in still more air, and so on. Thus by proportioning the relative sizes of receiving pipes and jet pipe a small jet of steam may be made to exert a powerful tractive force. The steam mixed with air forms a "vesicular gas" which is found to be a valuable propelling agent. If mixed with hot air, the "mixed gas" is not vesicular.

The inventor applies his invention, among other purposes, to ventilating mines and subterranean places. He also describes the use of the mixed steam and air for blowing fans. The "mixed gas" is claimed to be much more effectual for this purpose than steam alone.

[Printed, 1*s.* 2*d.* Drawing.]

A.D. 1855, May 23.—N° 1164.

SMITH, WILLIAM.—(*A communication from Nicholas Joseph Jacquet.*)—Safety cage.

The invention consists in "the connection of a pair of bent " levers or arms with the cage or slings of the corve," which arms are so arranged "that their shorter ends will press " against" the pit guides, being held free from them while the " cage is properly suspended, by means of a "long bow spring " acting upon the longer ends of the levers, and so keeping " them free; but upon the working chain or rope breaking, " the force of the spring is called into action by drawing the " extreme ends of the levers out of the horizontal position, "and so bringing them closer together." The shorter ends then nip the guides and so suspend the cage.

[Printed, 10*d.* Drawing.]

A.D. 1855, June 28.—N° 1475.

DAVEY, Simon.—Fuses for mining.

This invention consists, firstly, in the use of the thread saturated with inflammable composition, forming the subject of the Patent granted to the inventor and Adolphe Ludovic Chanu, dated 15 April 1852 (N° 14,065), as a centre thread in such as Bickford's fuses. Thus the fuse will not be inefficient though the column of powder itself be interrupted.

It also relates to an improved construction of fuse, in which several of these inflammable threads "are drawn around a "fixed wire or metal mandril, during which the flax, yarn, or "tape coating is applied; and before leaving the wire the "whole is passed through a bath of dissolved gutta percha. "Immediately after passing through this bath, the fuse leaves "the wire, which occasions a small vacuity in the centre of the "inflammable thread or threads, the coating being kept firmly "in its former position by the gutta percha." This fuse is intended to be very rapid in its action.

[Printed, 10*d.* Drawing.]

A.D. 1855, July 11.—N° 1550.

COULSON, John.—Ventilating mines.

This invention consists in drawing air into the mine by means of a falling current of water. Water is allowed to flow into a suitably constructed cistern at the top of the shaft, or, when convenient, above ground, and is caused to flow out again through a pipe which leads downwards to the mine. Above the mouth of this pipe is placed a short length of glass pipe, supported on a bridge across the mouth, and called the air pipe.

The apparatus works thus :—The water in escaping from the cistern down the pipe leading to the mine is caused to form a vortex in consequence of the arrangement of bridge and air pipe. This vortex imports a vacuum which is continuously filled by the inrush of air through the glass air pipe. This air is accordingly forced down with the water to the mine, and may either be taken directly with the water to the working, or the latter may be collected in a chamber and the air led away where wanted by pipes.

[Printed, 8*d*. Drawing.]

A.D. 1855, August 23.—N° 1913.

BARTLETT, Thomas.—Drilling or boring stone.

"This invention consists in so arranging machinery for drill- " ing or boring into stone, that the drilling or boring bit may " be" worked "by a series of blows communicated to it " through the medium of compressed air. For this purpose " a steam engine is employed, the piston rod of which is con- " tinued beyond the piston, and passes by a stuffing box " through the bottom of the cylinder; it carries a second " piston, which works in a second cylinder, in which also " another piston works, which piston is attached to a rod which " carries the" tool; "thus it will be seen that at each stroke " of the steam engine the air between the two pistons in the " second cylinder will be compressed, and the boring bit and " its piston will be driven forward. Connected with this " cylinder there is a weighted valve, which allows some of the " air to escape, so that on the return of the piston worked by " the steam engine a partial vacuum will be produced behind " it, which will cause the drilling or boring bit to exceed (*sic*) " a short distance, and as the piston arrives at the end of its " stroke it passes over a hole in the cylinder, which admits air " to supply the place of that which was forced out through " the valve. In order to give rotatory motion to the "tool," " the rod which carries it (which is round, with a slot or key- " way cut in it,) is made to pass through a similarly formed " collar, to which a toothed wheel is fixed, which receives " motion by suitable gearing from the crank shaft of the steam " engine, on which also an eccentric is placed, which works a " force pump, which supplies water to the boring bit through " its hollow stem." The machine is mounted on a carriage which is advanced as the work proceeds.

[Printed, 10*d*. Drawing.]

A.D. 1855, November 14.—N° 2561.

BURROWS, James.—Winding drum.

This drum is conically formed, and has upon its surface a groove or recess or channel in the form of a helix or spiral convolution, for the reception of the winding rope, which drum is intended "to equalize the weight upon the engine" while winding. The drum may be constructed of wood or metal or both. If wood be used, "segments of the helical curve may " be bolted or otherwise secured together, and the helical " groove or channel turned upon them; or wooden 'lags' may " be employed, having the helical groove formed of wrought-" iron and secured" thereon. When the drum is made of cast iron it is moulded by means of an angular frame which rotates round a vertical shaft placed in the loam bed. This frame shapes the profile of the drum and a traversing "loam-" board," actuated by a screw set in the angular framing shapes the spiral groove.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1855, December 6.—N° 2751.

CHAFFER, Thomas, and **ELLIS**, Jonah.—Machinery for sawing and cutting slate, stone, coal, salt, &c.

This invention is applicable to sawing or cutting minerals " from the quarry, and consists, first, in sawing seams into " the slate, or stone, or other minerals by means of a circular " saw, which is made to travel along a bed-plate fixed to the " slate" or other substance to be operated upon. "The " circular saw may be turned by hand or by steam or other " power, and the bed plate, after the seam has been cut, can " be removed to any other convenient position for making " another seam."

Another part of the invention consists "in causing a cutting " tool to move to and fro along a bed plate, and in so moving " to cut a seam into the slate" or other mineral, "the said " cutting tool being made to increase the depth of the cut by " means of a setting-up screw or other mechanism."

The tool is automatically reversed, and cuts both ways.

[Printed, 10*d*. Drawings.]

A.D. 1855, December 15.—N° 2835.

ROGERS, Ebenezer.—Safety doors for mines.

Two doors, each opening outwards from each other, are connected by a cord or chain or system of rods, attached to the upper part of each door at a convenient distance from the hinge, "and of such length as to be fully extended when one "door is shut and the other is wide open." Each door is also fitted with a weight or spring, sufficient to close the door when free from other influence. Pulleys are used to keep the connecting cords out of the way and to diminish friction. Sliding doors may also be used instead of hinged doors.

[Printed, 6*d*. Drawing.]

A.D. 1855, December 18.—N° 2868.

GLOVER, Frederick Robert Augustus.—Breakwaters, sea walls, &c.

This invention consists in constructing the foundations of works of the above kind, either with or without the other parts, by forming a framework of timber or iron, and so anchoring it that shifting sand may fill up and solidify the structure. Lime, or cement or concrete may be added to assist in the retention and solidification of the sand.

In order to form "sub-aqueous roadways, passages, or other "tunnels," tubes of timber or iron are fitted in the framing and form the subways when consolidated in the sand.

[Printed, 8*d*. Drawing.]

A.D. 1855, December 20.—N° 2876.

WALKER, Robert.—Winding machinery.

The engine power is applied directly to the shaft of the winding drum or wheel over the pit mouth. This drum has cogs or projections on its periphery, which take into the links of the chain used in winding. The chain simply hangs over the drum and has a cage at each end. If wire ropes be used pieces are rivetted to them at intervals, which take into recesses or on to projections prepared on the drum for the purpose. Two shafts may be worked by one chain or rope by means of this system of winding. The toothed drum is placed between the two shafts, and an end of the chain or rope is allowed to pass down each shaft. Thus in one shaft a load will be winding while the cage in the other is descending.

[Printed, 1*s*. 2*d*. Drawings.]

1856.

A.D. 1856, January 3.—N° 28.

MARSDEN, Charles.—Ventilating sewers, tunnels, mines, &c.

The ventilation is produced by "leading tubes, which may " be of different lengths, and of diameters increasing with " their lengths, into a sewer or other place to be ventilated, " which tubes open into various parts thereof, and at their " other ends lead either directly or through other tubes into " a main shaft, having an exit in the air, and provided with a " fan or other contrivance for producing a partial vacuum," by which means the vitiated air is withdrawn through the tubes into the shaft, and thence into the outer air.

In ventilating sewers it is necessary to "stop off or trap all " the gratings in the cross sewers or drains except the two " farthest removed from the main sewer," and those in the main sewer are similarly closed. The pipes are conveyed along the crown of the sewers. Mines are similarly ventilated, and the system is pointed out as applicable to the proposed sub-channel tunnel. The conducting pipes are made of metal or of gutta percha strengthened or not with metal collars, or of zinc lined and coated with gutta percha. A cowl or shield may be erected at the top or other part of the shaft to shelter the fan in high winds.

[Printed, 8*d*. Drawing.]

A.D. 1856, January 7.—N° 55.

BROOMAN, Richard Archibald.—(*A communication.*)—Machinery for boring and excavating.

This machinery, together with the boiler and engine for supplying the power, is set upon a carriage supported on wheels. The engine by means of toothed gearing communicates rotary motion to the horizontal boring shaft, at the front end of which is the tool or cutter. The other end of the shaft is supported against an upright held by cross beams in such manner as to allow of a slight play backwards, by means of springs or otherwise, in case the tool should be obstructed. The gearing also acts upon the wheels of the carriage so as to keep the machine up to its work. The excavating tool "con-

" sists of a circular plate, set vertically upon the shaft, and " fitted with teeth or blades of the particular form required " to suit the nature of the soil to be excavated."

The debris is removed by "hollow funnel shaped gatherers" fixed upon the shaft, and passed into a hopper, whence it falls into a waggon. "Near the fore part of the carriage are shoes " fixed to threaded upright shafts, and at the back of the " frame a roller is suspended from an upright shaft. On " bringing these shoes and rollers down, and taking the " weight of the machine from the wheels, it may be turned in " any direction by pushing round the roller." The tool may be worked with a reciprocating instead of rotary motion. The inventor mentions the use of the machinery in boring or excavating "earth, stone, and rock."

[Printed, 8*d*. Drawing.]

A.D. 1856, January 15.—N° 110.

BAKEWELL, Thomas Hill.—Ventilating mines, &c.

This invention relates to improvements upon an earlier patent granted to the present inventor (A.D. 1853, No. 1663).

With reference to the "culminator" it is stated that "for " those mines where only one shaft is used an extra tube will " be required to conduct the air out of the mine into the fire-" damp division of the machine," and "a tube may also be " used in any other upcast shaft, instead of an air-tight culmi-" nator." The tubes for introducing fresh air and exhausting the impure air "need only proceed as far as the beginning " of the air courses in the one case, and only to the termi-" nation of it in the other; but it is requisite for the air " courses to be made air tight at both ends, only allowing " admission to the tubes." Signal whistles may be fitted to the tubes. The machine may consist of two or more "divi-" sions," but it may also have only one "division," "provid-" ing that it brings into operation the double action of pro-" pulsion and exhaustion," which is an essential feature of the invention. The "domes" also may be dispensed with, so long as proper valves are fitted to the "body."

Various ways of working the bellows' "wings" by other than crank movements are described.

Heating and refrigerating apparatus may be fitted for house and other purposes.

The apparatus is described as also useful for ventilating "drains, culverts, wells, cellars, and other places."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1856, January 25.—N° 196.

TOLHAUSEN, Alexandre.—(*A communication from Rees Hans, John Loudon, and Otto Ahlstrom.*)—Boring rocks, &c.

This apparatus is only intended to be used where a hole already bored by other means is to be enlarged, or to have a chamber cut at the bottom to receive a blasting charge. The cutting tool is so contrived that it may be withdrawn into the bar as into a sheath, consequently the bar may be of the full size of the hole, and so give additional strength to the apparatus and support to the cutter. The cutter is projected and withdrawn by means of a longitudinal rod placed in the axis of the hollow cutter bar. The cutter works upwards from the bottom of the drift, consequently the resistance of the rock to the cut serves to keep the machine firmly in its place, and enables framing, except a small plate supported on set screws, to be dispensed with. The cutter is projected more and more from the hollow bar as the work proceeds, that is to say, the angle made by the cutter with the bar becomes greater until it reaches a right angle, when it ceases to be able to enlarge the hole. The apparatus may be used to cut a screw thread in the hole.

[Printed, 8*d.* Drawing.]

A.D. 1856, February 2.—N° 293. (* *)

CURTIS, William Joseph.—(*Provisional protection only.*)—"Improvements in machinery for excavating land for the "constructing tunnels."

"For this purpose a rectangular or suitable form of frame, "of a size depending on the intended tunnel, is constructed, "and is arranged when placed in an upright position to be "moved forward by hydraulic pumps or mechanical means "pressing against the work which has been completed. There "are three uprights; the two outer ones have reverse screw "threads formed thereon in such manner that a screw nut on "each of them when caused to rotate shall ascend its upright, "and then when it arrives at the end again descend. These

" nuts turn between two plates, which carry an endless chain, " and chain wheels, by which the chain is carried. The " central upright is a shaft which gives motion to the chain " wheels and chain. In order to cut or remove the land in " front the chain carries ploughs or cutters, which cut away " the land in front as the chain is caused to move. The central " upright or shaft is put in motion by a steam engine, which " moves on suitable rails up to the work. Rails are also laid " as the work progresses, so that trucks may bring up bricks " and materials to build up and form the tunnel, and the earth " is raised into the empty trucks by suitable buckets or lifters " put in motion by the steam engine."

[Printed, *4d.* No Drawings.]

A.D. 1856, February 20.—N° 439.

JOHNSTON, William Oliver, and DIXON, John.—" Im" provements in cutting and working coal."

The machine is intended to be worked by compressed air, steam, or other power. "Two steam or other cylinders are " worked in the usual way, and give motion to a fly-wheel " shaft, on which is fixed a cog wheel working into another " wheel fixed on the cutter shaft, which gives motion to the " drill or rotating cutter." The machine travels on a railway. When it is required to cut along the face of the walls, blocks or pillars, the axis projects from the side of the carriage, and as the carriage travels forward the cutters cut a grove along the bottom of the coal, which then falls, or is brought down by wedging. "When the machine is intended to cut the head" ways or boards, the cutting axis is placed at the fore part " of the carriage, and not at the side." "The axis is first " caused to drill into the coal by the forward motion of the " carriage, and when this operation is complete a sideway " motion is given to the fore part of the carriage" by means of an air cylinder pressing a piston rod against the side of the working, "so as to cut a groove along the bottom of the coal; " afterwards a groove is cut up one or both sides by elevat" ing the fore part of the machine and the cutting axis by " means of screws, which force down a part of the wheels at " the fore part of the carriage." By this machine also holes may be drilled for blasting.

[Printed, *1s. 10d.* Drawings.]

A.D. 1856, February 22.—N° 456.

GRIFFITHS, James.—Brake for colliery and other engines.

This invention consists in causing the brake blocks to press upon a toothed wheel instead of on a smooth drum. The inventor does not limit himself to the mode of application or to the position of the toothed wheel.

[Printed, 6*d*. Drawing.]

A.D. 1856, February 26.—N° 488.

COATS, George.—(*Provisional protection only.*)—Partitions or brattices for mines.

This invention consists in the application of sheet iron or other thin metal to the construction of brattices, in place of wood, canvas, or other material ordinarily used. The iron may be protected by paint, and fastened in various ways.

[Printed, 4*d*. No Drawings.]

A.D. 1856, March 4.—N° 547. (* *)

CODDE, Louis.—(*Provisional protection only.*)—" A system " of submarine communication."

In a mode of constructing submarine railways, iron tubes are employed, which, when united together, form a single continuous tube, in which the railway is to pass. The tubes are provided internally at proper intervals with joints. To prevent water from entering the tubes when being sunk and previous to their junction the extremities are closed with an iron plate screwed or bolted to the joints, with which one of the extremities of each of the tubes is provided.

One plate is concave and the other convex. By this arrangement when the tubes are united together, the plates fit into each other completely, and the tubes being screwed or bolted to the joint, the interior of the tubes becomes hermetically closed. When all the tubes are united together the plates are removed and the rails laid down. The external surface of the tube is coated with hydraulic cement, and, as a further precaution, previous to applying the cement, gutta percha or other analogous substance, may be laid over the points of junction of the pipes. When the depth of the sea renders it impracticable to place the railway on the bottom, the tubes may be supported in sections on floats, placed at the necessary parts, and the usual means of suspension are employed.

[Printed, 6*d.* Drawing.]

A.D. 1856, March 10.—N° 585.

EMERY, Francis Joseph.—(*Provisional protection only.*)—Safety cage.

Toothed racks are fitted in the shaft, and toothed pinions to correspond are mounted on the cage. On the axes of the pinions are ratchet wheels, in connection with which are pawls. These pawls are held out of the ratchet wheels as long as the cage is properly suspended, and the toothed pinions are consequently free to turn against the racks as the cage descends. Should, however, the rope break, the pawls fall into the ratchet wheels, arrest the toothed pinions, and so hang the cage in the racks. Two side racks and toothed pinions are considered to be sufficient, but four may be used if preferred.

[Printed, 4*d.* No Drawings.]

A.D. 1856, March 12.—N° 596.

PALMER, Christopher Richard Norris. — (*Provisional protection only.*)—Signalling apparatus for mines, &c.

This apparatus is worked by pneumatic power. The signals are given by means of an exhausting cylinder and piston which cause a partial or sufficient vacuum in distant signal cylinders or air vessels, connected with the former by flexible tubing. The signals may be visible or oral, as detonating or ringing or whistling. "To obtain an increase of power at any " one or more distant points," the distant cylinders and pistons are made "of greater internal diameter than the near or " exhausting cylinder, altho' the cubic contents of the latter " are greater than the contents of one or all such distant " cylinders."

The apparatus for striking "detonating or gunpowder sig-" nals" may be converted with "trifling alterations into an " improved blasting apparatus." By the power of the exhausted cylinder a match may be lighted to fire the charge.

The inventor also describes a striking apparatus for mine shafts, in which a bell is struck through the medium of wires extending from top to bottom of the shaft. The apparatus "has also a signal trigger."

[Printed, 10*d.* Drawing.]

A.D. 1856, March 12.—N° 597.

VIGARS, John.—(*Provisional protection only.*)—Raising in mines.

This invention consists in converting the rectilinear motion of the pump rods, and utilising it as a rotary power for winding and lowering. Two racks are fitted on the pump rod, which racks gear with a pinion, the rim and teeth of which are loose upon a boss fixed on the drum shaft. The rim of the pinion is divided in half, each half forming as it were a separate pinion. The insides of the peripheries of these halves are fitted with ratchets which work palls secured to the boss on the drum shaft. These pawls are so arranged that the drum is kept continuously rotating in one direction, although the two ratchets rotate in opposite directions. Disengaging gear is fitted to the apparatus for the purpose of stopping or changing the direction of the rotation of the drum, and india-rubber cushions or springs keep the pawls up to their work.

[Printed, 4*d.* No Drawings.]

A.D. 1856, March 20.—N° 665.

WADSWORTH, James.—(*Provisional protection only.*)—Apparatus for removing gases from mines.

This apparatus is intended to be used for the purpose of removing the gases which accumulate in the higher cavities of mines. It consists of a "pump, bellows, or fan, mounted "on wheels, adapted to the tramways" in the workings. "On "the same wheels or frame are placed boxes or compartments "for stowing lengths of flexible pipe or hose to convey the "gas from its place of deposit to the pump or bellows, and "thence to the air gate."

[Printed, 4*d.* No Drawings.]

A.D. 1856, March 24.—N° 690.

HEATON, Thomas.—"Self-acting doors and gateways."

This invention relates to a mode of causing doors, &c. to open or close by the weight of the waggon acting upon levers, rails, or platforms. A cross shaft is fixed under the road where the door is fixed, with two eccentrics fixed on it, and two bevil wheels working into two other bevil wheels on the bottom ends of the gate backs. These wheels are put in motion by the pressure of the weight coming on the levers, rails, or platforms on each side of the doors or gates; which are attached to permanent rails at about 15 or 16 feet from the doors, rising towards them about 4 or 5 inches above the road level, and connected with the eccentrics by two pairs of jaws. When the levers or platforms are relieved of the weight they are raised by springs. The same results are also obtained by connecting the platform with a cross lever in the centre, on the principle of a steelyard, to which motion is given by the weight passing over, thus causing the doors either to rise up, fall down, open sideways, or parallel to the levers or platforms. Modifications of the apparatus are illustrated and described. In mines it is recommended that there be two sets of doors, placed at a distance apart, so that the first will be closed before the second is open, and thus secure ventilation. To prevent slack or any substance falling on the rails and stopping the action of the apparatus, a piece of sailcloth is fixed longitudinally under the rails and over the openings between the platform and outside frame, so as to throw off any such obstruction from the joints.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1856, March 29.—N° 760.

PENRICE, Herbert Newton.—"Improvements in machinery "for driving galleries through rock and other strata."

"The machinery is constructed by 'jumping' or chipping a "cylindrical hole or gallery by means of cross-cutting steel "edges or points, fixed radially on a shaft, which revolves "slightly between each stroke, by which means the tools will "always be chiselling against an edge. The shaft is driven "backwards and forwards by a piston working in a cylinder, "and it strikes a tappet which works the valve or valves, and "by means of a small piston, or otherwise, communicates "motion to a ratchet wheel and worm to turn the shaft. The "machine moves forward on a bed plate fixed on a tramway "at the head of the gallery. The cylinder is supplied with "steam through a sliding or flexible pipe, and the pressure

" of the steam presses the machine forward, its advance
" being regulated by means of rollers or stops revolving with
" the cutters or jumpers, and resting against the face of the
" rock which is being cut; another sliding or flexible tube
" conveys away the exhaust or waste steam. . . . . Instead
" of working the machine by steam, it may be worked by com-
" pressed air, or other fluid, or by vacuum. The chips or
" debris are drawn out from the gallery or heading by a dredge
" working under the bed plate.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1856, April 3.—N° 805.

SMITH, Charles Colonel.—(*Provisional protection only.*) —Brakes for winding machinery.

The invention has for its object to do away with screws or weights as commonly used in putting on the brakes of mine engines, and to obtain a gradual application of the brake.

To the brake lever is attached a cistern, into which water is allowed to flow when the brake is to be used. The weight of the gradually filling cistern puts on the brake with corresponding progression. Shot or sand may be used instead of water. The brake is taken off by allowing the water to run off from the cistern.

[Printed, 4*d*. No Drawings.]

A.D. 1856, April 19.—N° 944.

LONGBOTTOM, Abram.—(*Provisional protection only.*)— Lighting and ventilating mines.

The illuminating gas is generated by the heat derived from the fuel used in creating a down draft to the mine. A suitable arrangement of oil gas apparatus is introduced into the mine, and for this purpose the inventor gives preference to the apparatus described by him in the Specification of his Patent of the 13th Sept. 1855 (No. 2071), which, however, does not appertain to this series of Abridgments. This apparatus is set to work by supplying the furnace with fuel and the retort with oil or melted fat. "A draft proportionate to the amount of fuel " consumed will then be created, and the heat generated by the " burning fuel will" vaporize the oil or fat. The gas is conducted by pipes to the workings and burned in fixed burners, guarded or not by gauze as required.

[Printed, 4*d*. No Drawings.]

A.D. 1856, April 23.—N° 970.

FORSTER, George.—Air doors for mines, &c.

These doors are arranged to permit waggons, &c., to pass without interfering with the ventilation of the mine. Double doors are placed at suitable distances apart, and so connected with each other by means of a rod or bar combined with suitable levers, that the opening of one door will necessarily close the other, or the next behind it; the second door cannot be opened till the first is closed. The cases in which these doors are hung are "extended on the side opposite to the hinges in the " form of the arc of the circle, described by the swing of the " door (which forms the radius), so as to keep the door almost " air-tight while opening." Where there are double ways or trams, the doors are hung upon central pivots, and have similar provision of casing. These doors being self-closing are intended to dispense with the attendance of "trappers."

[Printed, 10*d*. Drawing.]

A.D. 1856, April 26.—N° 1005.

VACHEROT, Alexandre.—(*Provisional protection only.*)— " Improvements in the construction of submarine tunnels."

According to this invention the tunnel is "composed of a " number of sections or short lengths, which are constructed " and completed previous to being submerged, and when sub- " merged they are rivetted together to form the entire length " of the tunnel; or the junction of the sections may be effected " by a species of self-acting hinged catch or catches, or snecks, " which will fall into their places when the section is brought " in contact with its neighbour, by which arrangement the " services of a diver may be dispensed with, as the sections " unite themselves. Each of these sections consist of two " D-shaped chambers of sheet or wrought iron, open at both " ends, and placed one inside the other, the inner one being " of the desired capacity of the tunnel; and the space which " intervenes between the inner and outer chamber or casing " is filled in with concrete, or any suitable hydraulic cement " or mortar which has the property of hardening when under " water. The inner casing is made of much stronger material " than the outer one, and both are well braced and strengthened " by suitable diagonal and other bracings and girders." When the sections have been submerged they are adjusted to the proper level by the aid of certain rods and foundation stones, which have been previously arranged for the purpose. "Before " each section is lowered into the water both its ends are tightly " closed by plates and india-rubber, or other packing, so as to " prevent the entrance of water therein, and the inner one of " these covers is removed when the section has been joined " on to its neighbour, which has been previously adjusted." " In this way the work is proceeded with until the whole length " of tunnel is completed."

"The outer casing of the tunnel may be coated over with " bitumen, to preserve it for a time from corrosion, but when " the hydraulic mortar, concrete, or cement has had time to " harden, the outer casing will be no longer requisite, as the " tunnel will consist, as it were, of one entire stone."

[Printed, 4d. No Drawings.]

A.D. 1856, May 9.—N° 1092.

BAYLISS, William.—(*Provisional protection only.*)—Chains for collieries, &c.

The improved chain is composed of "double or treble links, " the links being welded together during the process of mak" ing, by which means the wear upon the links is more evenly " divided, and the chance of breaking from defects or flaws " in the iron greatly diminished."

[Printed, 4d. No Drawing.]

A.D. 1856, May 9.—N° 1094.

HACKWORTH, John Wesley. — (*Provisional protection only.*)—Safety disengaging, reversing, and braking gear for mines.

The safety apparatus is set in operation by the cage itself on attaining a pre-arranged height. At this moment there is set in motion a horizontal lever, formed with a triangular "gab " or box" upon it. Near this gab is the reversing lever carried on a weigh shaft, and the gab, by means of its angular sides acts on a pin on this reversing lever and shifts it as desired. Before the lever can be shifted however, a spring catch has to be removed from its notch. This is done by a small bell-crank lever also acted upon by the gab lever.

According to another arrangement, the stopping movement may be made to shift the valves of a steam or hydrostatic cylinder, and thereby to shift the reversing clutch or other detail. A steam or hydrostatic brake actuator may also be employed.

Another part relates to improvements in winding gear "where " a clutch combined with two reversed bevil pinions in gear " with one large bevil wheel is used." In this case "frictional " pressure is applied to both sides of the driving pinions. " This duplex frictional pressure may be obtained either by " keying two frictional boxes upon the engine shaft, such " boxes being either internal or external cones, and being " outside the pinions, which are pressed up against them by " the central clutches or frictional boxes; or the frictional " boxes may be applied outside the pinions, and may be " actuated by reverse movements, so that the pinions may be " gripped between the outer and inner frictional boxes, and so " that the end pressure of the single clutch or friction box " upon which the shaft may be neutralised."

[Printed, 4*d*. No Drawings.]

A.D. 1856, June 23.—Nº 1470.

LONGRIDGE, James Atkinson.—Motive power for mines.

The invention consists, firstly, in "obtaining compressed " air in mines, by means of air pumps actuated by hydraulic " presses, or pumps placed in the mines and worked by means " of a column of water, which may be either the rising column " of the pumps or from other columns of water maintained for " that purpose;" secondly, in storing up the compressed air in reservoirs placed at various positions in the mines, "from " which station reservoirs the air is afterwards conveyed by " portable reservoirs to such places as it may be required for " actuating machinery;" thirdly, in applying heat to the compressed air to increase its effect, by "exposing it in a pipe " or chamber to the heat of a lamp or close furnace, fed with " the air which has passed through the working cylinder;" fourthly, in applying this compressed air power to locomotives by carrying the air in portable reservoirs on the locomotive or a separate carriage; and, finally, in an improved regulating valve by which the air is admitted to its work at any uniform pressure, although the pressure in the portable reservoir varies as the work proceeds.

[Printed, 10*d*. Drawings.]

A.D. 1856, June 25.—N° 1493.

BATES, George Armstrong.—(*Provisional protection only.*) —Safety cage.

This cage is fitted at the top, with horizontal bolts which are so contrived as to be liable to be pressed outwards by strong springs. When so pressed outwards they will engage with notches cut in the pit guides; but by means of a length of chain or a band attached to the bolts and hooked to the main rope, the bolts are kept drawn in to leave the cage free to ascend and descend. Should however the rope break, the bolts would be driven out into the notches and so sustain the cage. To prevent concussion or jerk, "yielding springs or buffers" are placed above the bolts.

[Printed, 4*d*. No Drawings.]

A.D. 1856, July 2.—N° 1550.

VAN HENGEL, Joseph Henry.—Safety cage.

The cage works between two pit guides. These are grooved for the cage to slide in, and their sides are cut into racks or steps. To the cage are fitted four plates which when pressed forward by strong springs, engage with the racks and so sustain the cage. The plates are held back from the racks by chains or ropes, each of which passes through a ring fixed to each corner of the cage and from them the cage is hung. "To " prevent the springs from being pulled back too far, so as to " break them, when the cage is suspended, a stop is fixed to " the chain at the proper distance."

"The different stories of the pits or mines are put in communication with the apparatus by means of moveable pieces " in the grooves, which can be used according to circumstances."

[Printed, 10*d*. Drawing.]

A.D. 1856, July 24.—N° 1759.

COPELAND, George Alexander.—Blasting cartridge.

The cartridge case is made of "paper or other materials, " such as linen, cotton, canvas, gutta percha, or india-rubber,

" cut to such a shape as that when coiled or rolled up it forms " a hollow conical or cylindrical shaped vessel." This case is closed at one end, filled nearly to the top with powder, a wad of horsehair inserted and closed. The fuse is fitted and the whole wrapped in twine or tape or wire and waterproofed.

[Printed, 6*d*. Drawing.]

A.D. 1856, August 4.—N° 1838.

WRIGHT, Alexander.—Lighting mines with gas.

In order to give the gas the requisite pressure to force it down the shaft and into the workings of the mine, it is forced into a receiver by a pump or exhauster applied to the outlet of the gas holder, or by the expansive force of the gas itself during its manufacture. "The receiver is to be of such weight, " that the pressure given by it is greater than the difference of " weight of a column of air and a column of gas the whole " depth of the mine or place, with the additional pressure " necessary for the friction of pipes and for the projection of " gas to supply the flame."

A governor is placed between the receiver and the lights in the mine to regulate the pressure. For the conveyance of the gas, iron pipes are used, with flexible pipes at the junctions, the flexible pipes being protected against injury when blasting.

[Printed, 8*d*. Drawing.]

A.D. 1856, August 23.—N° 1973.

WADSWORTH, James.—Ventilating mines.

The invention consists in removing the vitiated air or gas from the cavities of mines and conducting them into some adjacent air course, by means of a fan or pump. The patentee illustrates a pump for this purpose mounted on a carriage for conveying it and its stores and fittings where wanted. It consists further in withdrawing the gases through pipes by means of currents maintained in the pipes by rarefied air or gas directed into them. The apparatus for this purpose consists principally of two chambers, one within the other. The inner contains the fire or lamp for creating the draught, the outer vessel is in communication with the conducting pipes, and is traversed by the foul air, the temperature of which is raised in passing. A portion of the gas to be removed may be used as the source of heat, and for this purpose a gas holder or receiver is used, which is divided by a "horizontal per-" forated partition for the purpose of separating the more " inflammable portions of the gas." The gas is then conveyed into contact with a due supply of air for its combustion. The patentee also rarifies the column of air to create an ascending current in the upcast shaft of the mine, by the combustion of a portion of the noxious gases. The apparatus used for this purpose consists of a number of enclosed burners placed within the upcast shaft and supplied with air for supporting the combustion of the gas, conducted from the separating chamber.

[Printed, 1*s*. Drawing.]

A.D. 1856, August 26, N° 1990.

SIMPSON, Edmund.—Safety cage.

The cage is suspended from a cross tree having an eye at each end, which slides loosely over a notched pit guide extending from top to bottom of the shaft. Each end of the cross-tree is also provided with a pawl or bent lever one end of which is attached to the suspending rope. In case this rope should break, these pawls or levers at once engage with the racks on the pit guides and preserve the cage from falling.

[Printed, 6*d*. Drawing.]

A.D. 1856, September 29.—N° 2276.

BOYCOTT, Richard.—(*Provisional protection only.*)—" An " improved air door."

This door is constructed so as to be self-closing. For this purpose it is of an "irregular square form, and by preference " wider at the bottom than at the top." It is suspended "at " any angle required."

[Printed, 6*d*. Drawing.]

A.D. 1856, September 30.—N° 2288.

GARD, William Gostwyck.—Bits for boring and sinking.

These bits are improvements on those for which Letters Patent were granted to the present inventor on 21st October 1847, (No. 11,913.) They are now formed in two separate parts. " Cross or other suitable cutters " are placed across the mouth of a tubular shaft or holder and round them is placed a circular cutter or ring, "having slots instead of holes to prevent a "vacuum." This is made of greater inside diameter than the cross cutter for convenience of repair, and the slots make it elastic thereby facilitating withdrawal. A ball valve rests on a seating in the hollow shaft to retain the sludge as it passes upwards from the work.

[Printed, 8*d.* Drawing.]

A.D. 1856, October 11.—N° 2386.

HEPPELL, George.—Ventilating mines.

"The improvements relate to means for forcing air down "the shaft of the mine, thence to be distributed to the various "passages, as also for withdrawing the impure air or gases "from such places; and consists in forming such shaft with "parallel sides in such manner that the cage for the lift of "the mineral or other matter may by fitting tightly serve as a "bucket. Such cage or bucket being provided with a suitable "valve or valves, which acting with a valve or valves in the "headway become means in the ascending motion of the cage "of accumulating air in the shaft to be forced into the various "passages of the mine. By the descent of the cage, or by "reversing the positions of the valves, the cage or bucket may "be used as a means for withdrawing the impure air or gases." It is preferred "that the valves be placed in the upper part or "roof of the cage or bucket, and that the lower part or floor "simply have a hole or holes in it." A furnace in the upcast shaft may also be used to assist the work of ventilation.

[Printed, 2*s.* 2*d.* Drawings.]

A.D. 1856, October 14.—N° 2401.

KNOWLES, John junior.—Preventing overwinding.

For this purpose the inventor has contrived a species of catch or safety shackle from which the cage is hung. This shackle resembles very much a pair of pliers, fitted with a spring to keep them closed. The jaws are fitted with studs so that when closed they hold between them a link or loop on the end of the winding rope or chain. The cage is suspended from the axis of the pliers. As soon as the cage begins to be overwound, the safety shackle passes between stops which compress the arms, thus opening the jaws and releasing the winding rope.

[Printed, 6*d.* Drawing.]

A.D. 1856, October 14.—Nº 2403.

BROOMAN RICHARD ARCHIBALD.—(*A communication from Messrs. Murtineddu & Company.*)—Splitting or rending rock, &c.

"This invention consists in splitting or rending rock, stone, " and earth by the introduction into cavities or holes made " therein of a composition of sulphur, saltpetre, sea salt, " sawdust, and dung, which, on being ignited, rapidly develops " considerable heat, and so splits or rends the rock, stone, or " earth, as to allow of the ready removal of the broken or " separated parts." "Treacle or other like matter" is added to the composition to give cohesion. "This composition does " not cause explosion upwards, as with gunpowder."

[Printed, 4*d*. No Drawings.]

A.D. 1856, October 15.—Nº 2409.

BURROWS, JAMES. — Counterbalancing winding ropes for mines.

This invention consists in suspending an extra rope or chain to each cage. "The extra chain, &c. may either hang from " the cage simply, or be detached and coiled upon the bottom " of the shaft, or it may be united and attached to the other " cage, passing under a guide or tension pulley below, and " thus forming an endless chain." "The guide or tension " pulley should be capable of some vertical adjustment in its " bearings, so as readily to allow for the strain caused by the " increasing diameter of the winding drum as the rope, band, " or chain winds on."

The use of this invention is not confined to single shafts, " as the counterpoise rope, &c. may pass from one shaft to " another."

[Printed, 8*d*. Drawing.]

A.D. 1856, November 8.—Nº 2631.

VAUGHAN, CHARLES, VAUGHAN, WILLIAM JAMES, and VAUGHAN, RICHARD.—A new "strap or band" for "raising " minerals out of mines," &c.

The band or strap is made up of strips of some metal of sufficient elasticity to allow it to be run over pulleys without taking a permanent set, joined together by rivets, either end to end, or superimposed and breaking joint. The strips may be " covered or combined with gutta percha, india-rubber, or " other flexible material."

[Printed, 6*d.* Drawing.]

A.D. 1856, November 13.—N° 2673.

TREEBY THOMAS WRIGHT GARDENER.—(*Provisional protection only.*)—" Forming sewers or tunnels and gulleys to " sewers."

The patentee describes his method of working as follows :—

" I commence at the lowest level by sinking a shaft or " working as is usually done. . . . . As soon as this is done, " I lay down an invert made of cast iron or other material, " but if of cast iron, I have cast on the invert iron rails longitudinally, and if of other material, I form them on the " invert, so as to form a railway to take away the earth. On " the rails I have a centre framed, so that as the earth is taken " away the centre can be moved forward, to keep up the earth " and allow the brickwork to be proceeded with." He provides air tubes for ventilating the working, and the inclination of the tunnel or sewer serves to carry off the drainage water and to facilitate the removal of the earth by the railway. Should the sewer be made of iron, the inventor forms the pipes with longitudinal joints, as well as the common transverse joints. " The object of this is, that the pipes may be " taken through the sewer or tunnel in separate parts, and " afterwards put together."

The gulley pipes enter the sewer near the crown, instead of near the invert, by this means a regularly perpendicular fall is obtained whereby the cleansing of the trap or flap is secured. " At the bottom of the pipe that so enters," the inventor fixes "a flap or valve, hinged above the mouth of " the pipe at the back, so as to prevent it corroding. This flap and pipe may be ground to fit, or it may be trapped, or " any other plan such as in common use for trapping."

[Printed, 4*d.* No Drawings.]

A.D. 1856, December 8.—N° 2905.

EATON, RICHARD.—"India-rubber springs."

These springs are made of thin sheets of india-rubber kept separate by metal plates or divisions, the vulcanized india-rubber not exceeding half an inch in thickness.

This invention is based upon a property "discovered" by the patentee in regard to vulcanized india-rubber, which is, "that when a given weight of india-rubber is used in making "a spring, that if such quantity be subdivided into sheets of "less thickness than half an inch it wil sustain a far greater "weight, and still offer the requisite elasticity for a spring, "than if the whole quantity be used in one mass, or if the "mass be subdivided into thicknesses of half an inch or more, "and each piece separated by a plate of metal from the next "piece."

The invention is illustrated as applicable, among other purposes, to the bow springs of cages, and the buffers of the same.

[Printed, 10*d*. Drawing.]

A.D. 1856, December 11.—N° 2931.

GREEN, Jacob.—Lights for subways, &c.

The invention consists in "casting molten glass into iron or "other metal frames, the frames being made with a groove or "projections to prevent the glass leaving or shrinking from "the frame after it has become solid and annealed." The frames are also to be heated to a dull red heat, to prevent the chilling of the glass, and to ensure firm hold by contraction.

To facilitate the pouring, the ladle holding the melted glass is suspended from a pulley running on an overhead bar or railway.

[Printed, 8*d*. Drawing.]

1857.

A.D. 1857, January 30.—N° 284.

OWEN, James.—Safety cage.

The cage ascends and descends between a pair of pit guides. The sides of the cage are fitted with levers, the short ends of which are capable of gripping the pit guides between them. The long ends of the levers are attached to the suspending bars or corve bows, so that when the cage is properly suspended, the short ends of the levers are kept away from the pit guides. But should the rope break, the long ends of the levers are depressed by their weight or by the additional power of springs, and so cause the short ends to grip the slides and suspend the cage.

The bars which serve to retain the wagon or bucket in the cage are connected by levers, which cause the said bars to rise or fall simultaneously in front of both ends of the wagon or bucket.

[Printed, 8*d*. Drawing.]

A.D. 1857, February 25.—N° 551.

PIAUD, Laurent.—(*Provisional protection only.*)—Ventilating mines and preventing inundations.

"These improvements consist, first, in placing in the shafts " of coal mines a main feed pipe furnished with a piston, " which is worked by the steam engine employed in the mine " or by other means. This piston or pump is used to supply " the mine with pure air in the following manner;—At the " lower part of the feed pipe is a branch pipe or channel, " which enters a chamber containing a fan or ventilator, which " revolves in the direction given to it by the air from the " pump, and thus forces the air into another chamber by " means of a connecting pipe. The latter chamber is also " supplied with a revolving fan or ventilator, which compels " the air to enter through an opening into a circular or other " shaped gallery extending round the mine. This gallery " communicates with several other intersecting galleries, pro" vided with doors, if necessary. The deleterious gases, after " passing through chambers containing fans or ventilators of " the same construction as those already described, but moving " in an opposite direction enters an exhaust pipe placed in the " shaft by the side of the feed pipe. The exhaust pipe may " be furnished with a valve, through which passes the inflam" mable gas, which may be used for lighting purposes."

"Secondly, in preventing inundations in mines by the afore" said circular gallery, which acts as a recipient for the water " from the intersecting galleries."

[Printed, 4*d*. No Drawings.]

A.D. 1857, March 19.—N° 773.

REID, William.—(*Letters Patent void for want of Final Specification.*)—Guarding the mouths of pits, &c.

The apparatus consists of an "open rectangular timber frame, "large enough to embrace the opening at the head of the "shaft. This frame has its two ends hinged on so that it can "be easily opened out for adjustment without interfering with "the winding rope or cage. When the cage is down the shaft "this guard frame stands upon the pit mouth," "but when "the cage is wound upwards, projections upon the cage come in "contact with the feet of the frame and lift it clear of the pit "mouth." Then when the cage is up, it alone forms sufficient guard to the pit's mouth.

[Printed, 4*d*. No Drawings.]

A.D. 1857, March 26.—N° 850.

CLARK, Josiah Latimer.—(*Provisional protection only.*)—Lighting coal mines.

The object of this invention is to render the lamps used in these mines, whether portable or fixed, more safe. For this purpose they are put in connection with a main pipe, from which they are supplied with air under pressure. The air passes through a valve which would close were it not for the pressure, and after combustion escapes through a gauze protected opening at the top of the lamp. A trimming wire passes through a ball and socket joint into the lamp. Moveable lamps are fitted with flexible tubes. "The compressed air may be "supplied by a pump, worked by a steam engine, and furnished with a gasometer or regulating chamber, or otherwise; "and this apparatus may either be placed at the surface of "the mine or at the bottom of the downcast shaft," as convenient.

[Printed, 4*d*. No Drawings.]

A.D. 1857, March 28.—N° 867.

BEAUMONT, Edward Blackett.—(*Provisional protection only.*)—Indicating state of the atmosphere in mines.

This invention partly relates to an improved construction of safety lamp, but the remainder consists in apparatus for the above purpose.

"A light vessel, containing gas lighter than a like bulk of
" an atmosphere which is safe to work in, is connected to a
" suitable pointer or indicator in such a manner that when the
" atmosphere surrounding the instrument becomes unsafe by
" the admixture of gas, the vessel of the instrument will no
" longer be supported by the surrounding atmosphere, and
" will by its descent indicate that the atmosphere around the
" instrument is not safe to work in."

[Printed, 4*d*. No Drawings.]

A.D. 1857, April 21.—N° 1125.

COLLADON, DAVID.—(*Letters Patent void for want of Final Specification.*)—Boring and cutting machinery, and ventilating mines, &c.

The piston and cutter frames are attached to a circular plate, which is centrally bolted to another circular plate, the latter being attached at its circumference to one end of cylinder, held by pneumatic pressure against the face of the rock. The latter circular plate has a toothed groove round its periphery into which a pinion on the top circular plate takes, causing the top plate to rotate and the chisels to cut out a cylindrical piece of stone. When a straight cut has to be made the top plate pinion runs in a straight rack attached to the plate fixed to the rock. To cut out cylinders of stone, &c., two cylinders of thin sheet metal may also be used, the ends of which act as cutters, when turned reverse ways round their axes. The apparatus is also held to its work by pneumatic pressure. One of these cylinders is capable of being used by itself. "A new form of
" cutting tool is constructed by means of flexible elastic blades
" or strips of steel combined with tubular holders, which have
" lateral curved passages through which the ends of the blades
" are progressively protruded by means of screws, so that each
" cutting ends or edges will be caused to act more and more
" distant from the centre of the tubular holder, which cutting
" tool being caused to rotate or move with a straight to-and-
" fro motion." Means are provided for keeping the air always at the same pressure and for joining the pipes. The air may be heated or cooled to facilitate ventilation, and it may be used to force flame into the cuts and then a jet of cold water, by which operation the stone may be split up.

[Printed, 4*d*. No Drawings.]

A.D. 1857, April 25.—N° 1168.

OTWAY, Edmund Winder.—Raising, lowering, and signalling in mines.

To the platform upon which the skips are placed, are attached four "spring roller buffers, in order to prevent or lessen the " concussion of the same against the sides of the shaft." " The ends of the rail on the carriage are jointed and are pro- " vided with levers for raising the ends into a vertical position " in order to secure the " skip.

The cover to the shaft is provided with two bolts worked " simultaneously by levers and links, so as to lock the cover " when in its place (either on or off)."

There is also a "break acting upon a break pulley on the " drum shaft, and connected by a lever and link to a shaft " upon which is keyed a lever. This lever is placed near the " hand gear of the engine" to be under the immediate control of the engine man.

For the purpose of signalling "a bell is placed at the bottom " of the pit and another at the mouth. Each of these bells is " provided with a hammer actuated by a lever and spring. " These levers each vibrate upon a centre, and are connected " together by two wires, one on each side of the centre, so " that one lever cannot possibly be moved without moving the " other, by which means any numbers of blows may be struck " upon the bells with certainty by actuating the lever either " at the bottom or top of the pit."

[Printed, 1*s*. Drawings.]

A.D. 1857, May 7.—N° 1288.

MACKWORTH, Herbert.—Working mine pumps.

This invention relates to the use of flat bands made of " chains, metal plates, wire, canvass, leather, wire gauze " covered with gutta percha, or other suitable material pro- " pelled by prismatic or other rollers," for transporting minerals, &c., to and in ships, and to dressing and washing machinery, coke ovens, &c.

In the description of their use with improved washing machinery, it is mentioned that "the water may be conveniently " supplied from a drawing pump, which, when employed " underground for the additional object of draining the mine,

" may be either in a vertical or inclined position. In the " latter case, when raising or forcing the water up the long " ascending slopes of a mine, the piston may be conveniently " raised by means of a wire rope and a crank. The reaction " of the piston is produced by elastic cords or springs. When " the rope is of considerable length, it should be made, either " by bending the head of the piston rod or deflecting the pipes " to rub or work in contact with the inside of the pipe; the " rope will thus be prevented from becoming curved or " slacked, so as to diminish or affect the length of the stroke " of the piston. The rope working in water will require no " carrying rollers to reduce the friction, nor any other support " than it receives from the side of the pipe. The same " arrangement may be applied to a plunger pump."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1857, May 9.—N° 1308.

HEPPELL, George.—Ventilating mines.

When fires are used for this purpose the inventor places the furnace and its chimney inside a larger chimney or shaft. The heat of the furnace causes a draught in the outer flue or shaft, and this being in connection with the workings, serves as an exhauster of the foul air. The chimney of the furnace is continued sufficiently far up the large chimney to ensure that the foul air shall not come into contact with the fire.

By another system two shafts are sunk for some distance parallel with the upcast shaft which they then join by horizontal passages. These shafts are lined with wood or iron and fitted with pistons. The upcast shaft at the junction with the horizontal passage is fitted with valves. The action of the whole apparatus resembles that of an air pump. The pistons in the short shafts draw out the air from the lower part of the upcast shaft in ascending and in descending force it up the upper part of the shaft, where its removal may also be assisted by a furnace and shaft arranged as above described.

[Printed, 10*d.* Drawing.]

A.D. 1857, May 21.—N° 1431.

FONTAINEMOREAU, Peter Armand le Comte de.—(*A communication.*)—(*Provisional protection only.*)—Blasting rocks, &c.

The cavity for the powder is prepared by drilling a hole "about six feet in depth," and then introducing "hydrochloric "or other acid capable of acting on carbonates of lime." The acid works out a chamber at the bottom of the hole which is then charged and fired.

[Printed, 4d. No Drawings.]

A.D. 1857, May 23.—N° 1456.

TRAVIS, Edwin, and CASARTELLI, Joseph Louis.—"Regulating the supply and discharge of steam, air, water, "&c."

This apparatus consists of a valve which is intended to act also as a steam trap. The end of the steam pipe is connected through the intervention of a compensating pipe or arrangement with the end of a sliding tube which passes into a box through a stuffing box. On the opposite side of the box is similarly arranged a piston or plug worked by a screw spindle from the outside, and the bottom of the box is provided with an escape pipe. After the steam has been passing through the valve, the compensating pipe is warmed, and if then the valve, be closed by screwing up the spindle and the pipe be allowed to cool, the sliding pipe will be drawn back somewhat from the valve face owing to the contraction of the compensating pipe or apparatus, and the condensed steam will thus be allowed to escape into the box and thence by the pipe at the bottom. Various compensating arrangements are shown and described.

The apparatus is claimed to be applicable to "pipes," for "ventilating mines," &c.

[Printed, 1s. Drawings.]

A.D. 1857, June 11.—N° 1637.

FOLSON, Arthur.—(*Provisional protection only.*)—"Improvements in the construction of tunnels or ways under "water."

The tubes, which are of cast iron, are combined side by side, breaking joint one with the other. "The connecting ends of "the several lengths are formed to receive india-rubber or "other waterproof packing, and there are springs or other "such like clasps to enable one part to take hold of the other "under water, and form a tight connection till other more "permanent connecting means are supplied. Each length of

" way, when sunk into the water, has its ends temporarily " closed, but so that the removal of these temporary parts may " be readily effected at the union of two parts when such " union is complete." The inventor also dovetails the joints. He also employs "fluid metal to flow whilst hot into grooves " or recesses in the grooves between the adjacent tubes, as also " in the grooves or recesses at the junction of the continuous " tubes; bands and keys are also employed to tie the tubes " together." The tubes may be also double, that is, one within the other, the space between being ballasted with water. Moorings may be applied when required. The joints are also contrived to allow for expansion and contraction.

[Printed, *4d.* No Drawings.]

A.D. 1857, June 11.—N° 1639.

ROBERTSON, James.—Winding machinery.

These improvements relate to numerous applications of the frictional gearing for which the inventor obtained patents on the 6th June 1855 (No. 1294), and the 24th March 1856 (No. 692), the Specifications of which patents would not properly be abridged in this series. The invention is described as applied to winding machinery for mines. The winding drum is driven by a friction pulley on the first motion shaft, the bearings of the shaft being capable of adjustment to allow of proper frictional contact. By another arrangement the drum is driven by duplex oscillating pulleys worked by a lever which reverses and puts on the break as well. Segmental and grooved brake pieces are also provided for the drum and they are also provided with apparatus by means of which the arrival of the cage at a given height will automatically put on the brakes and shut off the steam. Various patterns of break pieces are illustrated in the drawings and described, varying chiefly in the way in which the grooves engage with each other.

The oscillating reversing gear consists of a pair of friction pulleys fitted in a rocking frame and having between them a smaller pulley on the continuously rotating shaft. By oscillating the frame and its pulleys either of the latter may be brought into contact with the pulley on the drum according to the direction of rotation required. Ordinary bevel reversing gear is also illustrated.

[Printed, *3s. 10d.* Drawings.]

A.D. 1857, June 11.—Nº 1642.

PAULE, JOSEPH MICHELL.—Ventilating mines.

A furnace is erected at the bottom of the upcast shaft and over it is placed a bank of tubes which are exposed to the heat of the fire. These tubes form part of the air conduit from the mine and they open into the chimney or flue built in the upcast shaft. The heated air in the pipes continually induces a current of foul air from the mine, and thus the foulest air can be drawn off without incurring risk from contact with the fire. The fire itself is supplied with air through other channels.

[Printed, 10*d*. Drawing.]

A.D. 1857, June 12.—Nº 1655.

BARSANTI, EUGENE, and MATTEUCCI, FELIX.—"Improved " apparatus for obtaining motive power from gases."

The motive power is derived from the explosion of a "mixture " of atmospheric air and hydrogen, or any other inflammable " gas." The explosion is effected by means of "an electric " spark applied to the under part of a piston working in a " cylinder." The apparatus is described as being intended to serve the purposes to which a steam engine is usually applied, but "if it be desired, for instance, to break stones for excavating " a tunnel, or to work a forge hammer, the chisel or " hammer may be adapted to the extremity of the piston " rod."

[Printed, 1*s*. Drawing.]

A.D. 1857, June 15.—Nº 1667.

HEATON, THOMAS.—Self-acting doors for mines, &c., and safety cages.

This invention relates to improvements upon the safety doors invented by the present patentee and patented on the 24th of March 1856 (No. 690). In the present case horizontal curved levers are fitted to the doors in such a manner that an approaching wagon will press against them and cause the door, or its two leaves, to slide back into recesses at right angles so the road. The doors are then closed by their own weight or by springs.

As a safety attachment to cages the inventor fits catches, resembling pairs of shears in such a manner that so long as the cage is properly suspended the long arms of the catches are maintained free from the guides, but should the rope break they are forced outwards by springs and sustain the cage in its then position. In order to prevent accidents from overwinding the shackle to which the cage is attached is caused to open by stops, on arriving at a given point the cage being freed and allowed to remain suspended by its safety catches.

The system of guards or bars for opening doors is also applied to the doors of hoists.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1857, June 19.—N° 1720.

RENNIE, Robert.—(*Letters Patent void for want of Final Specification.*)—Self-acting doors for mines.

The wagons used in the mine carry projecting pins which, as they approach the door, act upon the pendant catcher of a lever on that side in such a manner as to press forward the lever and by this movement through the agency of other levers open the door just as the horse's head reaches it. The same action brings forward the corresponding end of the other lever, so that, when the wagon has passed through the door, it operates upon this other lever, just as in the previous instance, closing the door and putting the lever first operated upon into a proper position for again opening the door on the approach of a succeeding wagon. When the trains are long the apparatus has to be modified in order to keep the door open during the passage of the whole train. This apparatus is so arranged that the wagons as they approach the door, always miss the far out action on that side of the door and operate upon that near the door; and on passing through the door the wagons always miss the rocking shaft action nearest the door on that side and operate upon the one furthest away. Various arrangements of opening catches may be used for this purpose. A spring or weight is applied to close the doors after they have been opened by foot passengers.

[Printed, 4*d*. No Drawings.]

A.D. 1857, July 3.—N° 1863.

ROYDS, Thomas, ROSCOW, Thomas, and LORD, James.—Raising minerals from mines.

This invention, which relates to the above as well as to other lifting purposes, consists in placing the minerals or other objects to be raised upon a platform which travels vertically upon a screwed shaft. This shaft being continuously rotated raises the platform and with it the object upon it.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1857, July 9.—N° 1913.

DELMAS, Florentin. — (*Provisional protection only.*) — Ventilating ships, mines, &c.

A current of wind or air is brought into the place to be ventilated by means of a pipe, the mouth of which is always kept turned to the wind by a vane. The foul air is removed by another tube extending to the bottom or floor of the place to be ventilated, and fitted at its mouth with two hoods or covers, which serve the double purpose of sheltering the mouth from rain and of creating an induced current in the pipe itself. "The extremities of the tubes may be furnished with convex "surfaces having the form of a watering pot rose."

[Printed, 4*d.* No Drawings.]

A.D. 1857, July 14.—N° 1957.

KINGSLEY, Jeffries.—(*Provisional protection only.*)—Raising water from mines.

The power for this purpose is derived from a vacuum produced by the current of water from a river. The water is allowed to flow into a cistern fitted with suitable valves. When full the inlet is stopped and the water allowed to flow out of a pipe which is so arranged as to afford a fall equal to the height of the barometric column. The resulting vacuum in the cistern draws the water up the main in the mine shaft. If it be not practicable to give the necessary fall to the outlet, the pipe may be shortened and fitted with a pump to be worked by the surplus stream from the river.

[Printed, 6*d.* Drawing.]

A.D. 1857, July 25.—N° 2031.

BENNETT, Joseph.—(*Provisional protection only.*)—Boring tools for wells, shafts, &c.

The inventor forms an "Achimedean screw augur with a hole "made longitudinally through it for the purpose of passing "the rods," and then connects it "by a key or rod at bottom, "whereby the same is set in motion by the revolving of the

" rods. The hole must be sufficiently large for receiving an " octagon or like shaft. The material bored thereby is col- " lected on the threads of the screw or augur, and at stated " revolutions it is raised by sliding it up the rods by means of " a chain and revolving shackle attached thereto." Other tools may be used in like manner. "The sliding shaft while " boring passes through a driving wheel with a revolving " shackle attached at the top and connected with intermediate " rods below."

[Printed, 4*d*. No Drawings.]

A.D. 1857, July, 27.—N° 2044.

ANDERSON, Frederick Bonaparte.—(*Provisional protection only.*)—Mechanical slow match for mining.

A train of wheels, driven by springs or otherwise, is so arranged as to be capable of liberating a hammer or other instrument at a regulated time, so as to fire a percussion cap or other fire-producing agent.

[Printed, 4*d*. No Drawings.]

A.D. 1857, August 18.—N° 2189.

HUGHES, Hugh Pritchard.—(*Provisional protection only.*) —Rock-boring machine.

The improvements claimed are, firstly, "the mode of raising " the jumper by means of two excentric sheaves, instead of by " levers, springs, &c. When the major or full sides of the " sheaves come round they close in and press the jumper, so " that it is carried up with them;" secondly, "the form of the " jumper being comparatively of little bulk, but made heavy " and steady by means of a moveable weight attached to the " top by means of an iron wedge driven into" an "opening in " the middle of the top of the jumper;" and thirdly, the form of the point of the jumper shown in the drawing, where it appears as chisel-shaped and larger than the jumper itself in diameter.

[Printed, 6*d*. Drawing.]

A.D. 1857, August 27.—N° 2271.

AYTOUN, Robert.—Safety cage.

"Four strong blade springs are provided for each cage, two " for each guide in the shaft. These springs are so contrived

" that they have a constant tendency to grasp or clip the " guides, and have a strong frictional hold upon them. The " lower portions of these springs are firmly attached to the " cage body, whilst their upper ends are jointed by means of " suitable links to a set of levers carried by the cage top ; the " inner contiguous ends of these levers are jointed to fixed " centres upon the cage, whilst their outer free ends are con- " nected to the actual winding rope." Thus so long as the rope is in order the springs are held from the guides, but on the breaking of the rope the springs immediately exert their friction and sustain the cage.

[Printed, 10*d*. Drawings.]

A.D. 1857, September 8.—N° 2345.

HOWARD, William.—(*Provisional protection only.*)—Supplying air to mines, sewers, &c.

The inventor purposes to lay a "pure air main along the " roof of some of the main passages of the mine," which main " should be provided with branch pipes and mouthpieces at " convenient distances, so arranged that the men can obtain " immediate access to them when desired, so that should any " foul air or choke damp suddenly manifest itself in the mine, " the men may instantly resort to the breathing tubes and " there remain until the foul air is cleared out."

For sewers a portable apparatus is designed, consisting " simply of a double valve mouthpiece to cover the nose and " mouth, attached to one end of any convenient length of " flexible pipe or tube, the other end of which should remain " open."

[Printed, 4*d*. No Drawings.]

A.D. 1857, September 25.—N° 2479.

NEWTON, Alfred Vincent.—(*A communication.*)—"Rock " drilling machinery."

"The inner or rocking frame, which carries the operating " parts is mounted on a central screw pin projecting from the " main framing, and it is held in position by a binding nut " and by a clamp, which latter passes through the inner frame, " and catches on to a flanged piece concentric with the screw " pin, and fixed to the main framing. The drill is free to " slide up and down in guides carried by the rocking frame,

" and it passes through the centre of a suspended box and
" through a ratchet wheel, which is supported by guide plates,
" and fitted to rotate with the drill. The box is suspended
" from a strap attached to a rocking frame, which is operated
" by a set of rotating wipers actuated by a crank or winch
" handle. As the box is raised, it is drawn out of a horizontal
" position, and is thus caused to bite against the drill and lift
" it up; but immediately the lift ceases, the drill falls by its
" own weight upon the rock below, being further impelled by
" the pressure of a coiled spring upon the lifting box; to
" prevent the recoil of the box a supplementary coiled spring
" is employed. As the box descends, an antifriction roller
" which it carries bears against a pendant arm connected to a
" pawl that operates the ratchet wheel before mentioned, and
" thrusts it back against the pressure of a spring in its rear.
" This movement causes the pawl to pull round the ratchet
" wheel, and impart an axial motion to the drill at every
" successive descent."

[Printed, 6*d*. Drawing.]

A.D. 1857, September 29.—N° 2501.

BROOMAN, RICHARD ARCHIBALD.—(*A communication from M. Trautmann.*)—(*Provisional protection only.*)—Raising and lowering in mines, pumping and ventilating.

Two atmospheric tubes are placed in the shaft, the cage being attached to the pistons. Apparatus is provided for closing the valve, which is of the usual form, and a telegraphic apparatus is added to convey orders, and to give indication of the position of the cage in the shaft. Buffers and catches provide for the safe reception of the pistons at the top of the tubes. In order to extract water, the cage is made with a double bottom and valves, so that at each descent it may collect a quantity of water. The tubes may be used as a means of ventilating the mine.

[Printed, 4*d*. No Drawings.]

A.D. 1857, October 28.—N° 2727.

ADDISON, JOHN.—Detecting the presence of and destroying gases in mines.

A wire or cord is placed from one end of a working to another. To this are attached by silk threads small balloons filled with hydrogen gas. If the mine be clear of hydrogen or carburetted hydrogen, the balloons will float in contact with the roof, and will be depressed in proportion to the presence of either of these gases. To fire the gas electricity may be used, with or without gunpowder, the latter, if necessary, being elevated on a sliding stand to the height of the gas. The electrical apparatus is placed in a safety chamber near the shaft bottom, where also men and horses can take refuge. Or the gas may be fired by the passage of a rocket along the wire, the rocket being attached to a ring or ferrule running freely on the wire; the balloons being removed in any case. To detect the presence of carbonic acid, balloons filled with air or oxygen are thrown upon the ground.

[Printed, 4*d*. No Drawings.]

A.D. 1857, November 7.—N° 2821.

BAINES, Hugh.—Safety cage.

Part of this invention has reference to the arrangement of apparatus for sustaining the cage or hoist in the shaft, upon a breakage of the rope, and also for moderating automatically the speed of descent.

For the former purpose, the rope is attached to the cage through the medium of india-rubber springs, which are compressed by the strain, and which, upon the breakage of the rope, force outwards pawls or teeth, which engage with the sides of the shaft, or the racks placed for the purpose.

In order to effect the second purpose, a governor of the ordinary pattern is placed on the top of the cage, and is rotated by means of a friction wheel running against the guides in the shaft. The governor brings brake apparatus into work when the speed of descent causes it to rotate too rapidly. When the cage is ascending, the friction wheel is automatically moved out of contact, and the governor is at rest, but is ready to recommence work upon any reversal of direction of the cage.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1857, November 19.—N° 2914.

KEIGHTLY, Benjamin.—(*Provisional protection only.*)—Indicating the flow of air to mines.

This apparatus consists of pointers worked by means of a pendulum or vane. Its mode of action is this:—"Suppose it "be desired to register any deviation, as, for example, any

" reduction from the supply of air determined on for the " healthy ventilation of a mine or pit, the pendulum pointer " working with the pendulum will indicate the greatest force " of the current; by its elevation the registering pointer is set " in proper position to correspond with the situation of the " pendulum. Should the current be varied (say diminished), " the pendulum or indicating pointer will come in contact with " the stud on the registering pointer, and move such pointer, " or cause it to travel backward on the dial, so as to denote " the lowest amount of air supplied, in which position it will " remain until reset by hand, thereby registering the variation; " the time of its occurrence being recorded by the stopping of " the time piece by a wire or catch on the pendulum."

[Printed, 4*d*. No Drawings.]

A.D. 1857, December 21.—N° 3130.

RENNIE, Robert.—(*Provisional protection only.*)—Self-acting doors for mines.

The door is fitted with a system of levers in such a way that as one lever on the one side of the door is moved back by the advancing carriage, the corresponding lever on the other side is moved forward. Thus the wagon opens the door as it advances, and closes it as it reaches the lever on the other side. To provide for the passage of a train of wagons, a series of catches is arranged in such a way that the wagons as they approach the door always miss the far out action on that side of the door, and operate upon that near the door, and on passing through the door they always miss the rocking shaft action nearest the door on that side, and operate upon the one furthest away. A spring or weight provides for the closing of the door after the passage of foot passengers.

[Printed, 4*d*. No Drawings.]

A.D. 1857, December 29.—N° 3183.

GOMEZ, Edwin, and **MILLS**, William.—Safety fuses for blasting, &c.

A mixture of equal parts of chlorate of potash and ferrocyanide of lead, or of tin or zinc and alcohol is painted on paper strips, which are then encased in a winding of fibrous material, tape, or similar substance, that will keep the powder in place when dry. The fuse so made is coated with shellac or other varnish to resist moisture, though the fuse will fire even when slightly damp. It may also be waterproofed by immersion in tar, pitch, gutta-percha, or equivalent material. It will not fire loose powder, on account of the rapidity of explosion scattering the grains, nor will it detonate except under severe blows.

[Printed, 4*d.* No Drawings.]

1858.

A.D. 1858, January 19.—N° 87.

BRUFF, Peter Schuyler.—(*Provisional protection only.*)—"Improvements in the construction of submerged tunnels."

The tunnel is made up of lengths or sections of tubing built up of iron plates, duly strengthened and bolted together. Each section is closed temporarily at the ends and sunk into position in a dredged trench or not, according to the nature of the bed. Or the sections may be used as diving bells, and so form ready means of adjusting them in position. A lining of hydraulic cement or masonry is built up in the tunnel, and the outside is covered with concrete blocks or rubble stone. The sections may also be secured by Mitchell's screw moorings.

[Printed, 4*d.* No Drawings.]

A.D. 1858, January 26.—N° 141.

NEWTON, William Edward.—(*A communication.*)—(*Provisional protection only.*)—"Improved machinery for mining "coal and other mineral substances."

It is also "applicable in other mining or tunnelling operations."

The machine consists principally of a rotary cutter wheel, made up of a number of "chisel-edged cutters and oblique-"edged cutters applied to the periphery of the horizontal "cutter wheel, and they are arranged in such succession as to "cut different parts of the groove that is required to be "made."

"The axle of the wheel is supported in bearings that in depth "do not exceed the thickness of the wheel. By this means "the cutter wheel is enabled to cut its way beyond its axle, "which will be able to enter the groove cut by the wheel."

[Printed, 4*d.* No Drawings.]

A.D. 1858, February 5.—N° 215.

WOODWARD, Adam, and PERCY, William Carter Stafford. — (*Provisional protection only.*) — Safety cage, and other apparatus for preventing accidents in winding.

This invention consists, firstly, in attaching levers to the cage, which, when the cage is properly suspended, are lifted and so withdraw friction blocks from the guides ; but when the rope is slack or broken, the levers are free, and springs then bring the friction blocks against the guides and sustain the cage ;

Secondly, in providing against the rapid unwinding of the rope from the drum in the case of the breakage of the driving belt, by adapting a friction break, the lever of which rests on the belt when unbroken, but which falls and puts on the break when the belt breaks ;

And thirdly, in providing a kind of centrifugal apparatus which is so contrived as to put on the break when the speed becomes excessive.

[Printed, 4*d*. No Drawings.]

A.D. 1858, February 10.—N° 250.

AYTOUN, Robert.—Safety cage.

Jamming levers are fitted to the cage, and they are recessed or contrived with jaws which embrace the guides. So long as these levers are held in a horizontal position by means of the suspending rope, they are maintained free from the guides ; but if the rope should break, the reaction of springs attached to the jamming levers would bring the levers into a proper position for jamming against the guides.

"To prevent the jamming edges from injuring the guides by " indenting them too severely, the acting edges may be some- " what rounded off, and to prevent the jamming action from " wearing the guides too much by the continual jamming of " the lever holders at the top and bottom of the shaft, the " guides at these parts may be protected by sheet iron or " otherwise."

[Printed, 8*d*. Drawing.]

A.D. 1858, February 25.—N° 375.

BARNES, John Bowen, and LOACH, John.—Safety cage.

The cage or skip is fitted into a kind of frame, in which it is capable of sliding vertically. A central bar or rod passes upwards from the bottom of the cage, and to this the rope is attached. Round the bottom of the frame are levers, which are capable of being pressed outwards by the weight of the cage, should it rest upon them. Thus if the rope were to break, the cage falling in its frame would press these levers out against the side of the shaft, and the sustaining effort is assisted by means of a set of horizontal spring buffers fitted round the top of the frame, which are also held back by the rope when the cage is properly suspended.

[Printed, 10*d*. Drawing.]

A.D. 1858, February 26.—N° 385.

MACKWORTH, Herbert.—(*Provisional protection only.*)—Raising and lowering, &c. minerals.

Endless bands are used for this purpose. The edges of the bands are contracted in order to confine the minerals, or a cover in the shape of a band of rods or chains and plates is pressed against the minerals by springs or cords. The band may be made in loose folds to adjust itself to large fragments. "In raising or lowering minerals, either dry or in the state of " sludge, or suspended in water," "two endless bands with " elastic ribs or edges on one or both of them" are used, " and in removing the fragments detached in boring by currents of water, one or more flexible tubes may be used for " conveying the minerals, and suspending the boring tool and " rods, or for lining the inside of the bore hole to conduct the " water."

[Printed, 4*d*. No Drawings.]

A.D. 1858, March 1.—N° 402.

GREENLEY, David, and DAFT, Thomas Barnabas.—(*Provisional protection only.*)—Boring machinery.

The direct action of steam is used, without the interposition of gearing. The boring tool is attached to a bar which works in a hollow piston rod. The piston rod raises the bar, but when the steam is allowed to escape from the cylinder the bar descends by its own weight. To the upper end of the bar is attached a wheel, by means of which rotation can be communicated to the tool.

The boring "tool is a metal cylinder, on the under edge of " which steel cutting tools are fixed; and there are also cutting

" tools placed radially. The debris produced by the tool " passes up inside the tool, and passes through a valve, so that " each time the tool is lifted the debris is lifted with it, and " is thus prevented from falling to the bottom of the hole."

To prevent vibration when the hole is of considerable depth, washers of vulcanised india-rubber are slipped on the rods at intervals; "and these washers, being but slightly smaller in " diameter than the hole itself, come in contact with the side " of the hole as soon as vibration commences, and thus the " vibration is immediately checked."

[Printed, 4*d*. No Drawings.]

A.D. 1858, March 20.—N° 575.

MENNONS, Marc Antoine François.—(*A communication.*) —(*Provisional protection only.*)—" Improvements in the " piercing of tunnels."

This invention "consists in forming a man-hole at the axis " of the tunnel, which hole, when it has attained a certain " length, is mined with gunpowder, in order to blow up the " earth to form the first arch. A number of arches are formed " in this manner gradually varying in size: when the arch " forming the entrance of the tunnel is made of the required " dimensions it is then built up with masonry in the ordinary " manner."

[Printed, 6*d*. Drawing.]

A.D. 1858, April 19.—N° 849.

WESTHEAD, Marcus Brown, and BAINES, Hugh.—(*Provisional protection only.*)—Safety hoisting apparatus.

Part of this invention relates to the hoists constructed for the purpose of raising and lowering railway rolling stock from one level to another, and to means of scotching the wheels of such rolling stock.

The invention further consists in "arrangements of mechanism to disconnect the motive power from the machinery " which regulates the ascent and descent of the hoist, in case " one or more of the ropes or chains by which the platform is " suspended should break, and also immediately apply the " brake or mechanism connected with the platform of the " hoist to prevent its descent. These arrangements consist of " levers, which are pressed against the ropes or chains sus-

" pending the platform by weights or springs, so that when
" a rope or chain breaks, they allow the weights or springs to
" bring into operation mechanism that disconnects the driving
" apparatus, and applies the brake or other mechanism to
" prevent the descent of the platform."

[Printed, 4*d*. No Drawings.]

A.D. 1858, April 30.—N° 971.

DEMANET, Charles Armand Joseph.—(*Provisional protection only.*)—Raising minerals from mines.

For this purpose two screwed bars or rods are placed in the shaft, resting in steps at the bottom and turning in bearings at the top, where they are also fitted with toothed gearing. A platform works between these screws, the latter passing through screwed apertures in the former. Thus, as the screws are rotated, the platform is raised or lowered as the case may be. Spring holders sustain the screws at intervals, their jaws being opened by bars attached to the platform as it approaches them. Another set of screws may be fitted to the first set to work simultaneously a second platform.

[Printed, 4*d*. No Drawings.]

A.D. 1858, May 12.—N° 1072.

JACKSON, Joseph Gratian.—(*Provisional protection only.*)—Subaqueous ways.

A water-tight tube is built, or being built, is placed on the surface of the water. This tube is of wood or iron, and through it is constructed a road or railway, enclosed within another tube, or other tubes, or not. Pieces of glass, or other suitable material, are inserted in the tube to admit light. The tube when completed is sunk to the bottom, where it may rest in a bed prepared for it, or where it may be otherwise supported; or it may be suspended in the water from pontoons.

[Printed, 4*d*. No Drawings.]

A.D. 1858, May 18.—N° 1105.

HIGGINS, John.—(*Provisional protection only.*)—Preventing explosions in mines by leading steam from a boiler, placed either at the top or bottom of the shaft, to the workings, where, by mixing it with the inflammable gases, their dangerous properties are neutralised.

The boiler is "a tubed boiler," the furnace having two or " more hollow shelves with vertical tubes, the said vertical " tubes to be larger in diameter in the top shelf than the next " under it, decreasing in diameter in each succeeding shelf, so " that the fire being made in the top part of the furnace it will " fall through the vertical tubes to the lower parts of the " furnace in succession, according to the number of shelves or " compartments in the furnace. These shelves may be made " of wrought or cast metal, but sheet iron will be found " the most economical." They are to slide in and out of the furnace, and may be used also to heat the feed water which is to pass through them.

[Printed, 4*d*. No Drawings.]

A.D. 1858, June 21.—N° 1403.

SCRIVEN, GARDNER RUSSEL.—(*Provisional protection only.*) —Ventilating mines.

A cylindrical drum revolves on bearings inside a reservoir containing air and water. Inside the drum is a spiral pipe open at the end and communicating through one of the journals with a discharge pipe. An air pipe is fitted to supply the reservoir with air. This air pipe is placed in communication with the mine and the drum revolving partially immersed in the water, causes the spiral pipe to take up a quantity of air and water, which is discharged in the form of alternate jets of air and water, thereby tending to create a vacuum in the reservoir. The air from the mine, however, supplies the vacuum, and the water is caused to be returned to the reservoir for use over again. If it be desired to force fresh air into the mine the feed and discharge pipes are simply reversed.

[Printed, 4*d*. No Drawings.]

A.D. 1858, June 26.—N° 1450.

ERHARD, CHARLES. — (*A communication from Messrs. Chanoit and Catelineau.*)—Apparatus for boring wells.

For the purpose of removing the debris, water is forced down the well and up a tube, to the bottom of which the tool is attached. The water may be forced up the tube by a piston, or the tube may have a valve opening downwards, near its end, or the tube itself may be fitted with a piston.

The boring tool is not permanently attached to the tube, but to a short tube which slides on its end; and on the main tube are two levers fitted with hooks or catches which engage with projections on the tool tube, and so raise the tool; but when the tool reaches its highest point, the catches release it and allow it to fall. This action may be accomplished by the current of water through the tube, acting on the levers, or by a kind of float of wood, or by a set of stops provided on a small tube placed within the main tube.

Apparatus for enlarging the boring is described. In this case the cutters are attached to rods which move up and down, the central tube being stationary a piston is worked in the tube, its rod being in connection with the cutter rods, and thus a circulation of water is maintained in the tube. The end of the tube enters the boring already made and is steadied thereby, branch pipes acting as removers of the debris from the cutters.

The sides of the well are supported by cast iron rings, introduced by means of a frame having a conical end, which is first placed in the boring and the rings slid down the frame, after which it is withdrawn.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1858, July 8.—N° 1531.

MARLAND, John, and WIDDALL, James. — Self-acting safety hook for mine cages, &c.

This hook is intended to open or give way when it has arrived at the limit of safety in elevation. It is jointed where the cage hangs, the free end being held or clipped by a catch acted upon by a spring when in a normal condition of safety, but which catch gives way when it comes in contact with a projection provided for the purpose, when the hook comes too near to the winding drum or pulley.

[Printed, 10*d*. Drawings.]

A.D. 1858, July 8.—N° 1532.

GIDLOW, Henry.—Brakes for winding machinery.

The brake is a semicircular band of iron suitably lined, and pressing on the fly-wheel. One end is attached to a stud or shaft, the other is fixed by means of a regulating screw to a chain. As the gear winds this chain is also wound on to a pulley, and properly regulated as to length, the brake is put on automatically at the proper moment.

Similar apparatus is provided for lifting the eccentric rod from the valve rod, and so stopping the admission of steam to the cylinder of the engine.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1858, July 14.—N° 1583.

CHAPUSOT, François, and AVRIL, Victor.—(*Provisional protection only.*)—Producing a vacuum for industrial purposes.

A sheet iron vessel, with cast iron top and bottom, is filled with water, which is then allowed to flow out. A vacuum is thus created in the vessel which may be utilized for various purposes, such as "emptying sewers" and "ventilating mines."

[Printed, 4*d*. No Drawings.]

A.D. 1858, August 24.—N° 1920.

SCHRADER, Carl Adolph.—(*Provisional protection only.*) —Boring tool for blasting, mining, forming artesian wells, &c.

It consists of a metallic bar "with a point or head of steel " furnished with three chisel-pointed cutters, so arranged as " to admit of the instrument turning on the centre one, the " point of which is formed to extend below the others for that " purpose, so that by a downward force or pressure, and rotatory " movement being communicated to the said instrument by " hand or machinery, the operation of boring may be effected " with less labour and greater precision than hitherto."

[Printed, 4*d*. No Drawings.]

A.D. 1858, September 3.—N° 1998.

ROBERTSON, James.—Belts for winding, &c.

The improved belts are made of "corrugated, undulated, or " indented plate or sheet metal," the corrugations or undulations being transverse to the length. These corrugations give elasticity to suit irregularities in the pulleys or in the belts themselves. The belts may be made in a great variety of ways, and other materials may be combined with the metal. The indentations may also be filled with pitch or gutta percha to increase adhesion, and the pulleys may be serrated, or otherwise prepared to receive the belts. "When a belt of extra strength " is required to transmit or sustain a great strain, as in coal pit " winding machines, two, three, or other number of thin cor- " rugated metal belts may be combined together," and "bound

" together at intervals by means of fine copper or other wire " lapped round them." It is "preferred to make the corru- " gations of the several component belts to coincide, and to " apply each binding at a corrugation; or, instead of forming " these component belts with small corrugations at separated " intervals, they may be formed so as in their free unstrained " condition to present a continuous undulatory contour."

[Printed, 2*s*. Drawings.]

A.D. 1858, September 16.—N° 2096.

ALLISON, RICHARD.—(*Provisional protection only.*)—Boring and sinking.

The boring tool is hollow, furnished at the bottom with a series of cutters, near which, but inside the tool, is a valve of india-rubber or such substance, the edges of which rest upon a ledge fixed on the inside of the tool. A "door or trap" is fitted to the side of the tool, the bottom of which is in a line with the valve seat.

For the purpose of raising the debris, a pump or vessel is employed, "consisting of two cylinders, one over the other, " and the upper cylinder capable of sliding inside that under " it; the bottom cylinder is provided with a valve opening " inwards, and over the top of the upper cylinder there is a " similar valve." When the pump is lowered, "the upper " cylinder will fall within the lower, then, upon the upper " cylinder being raised, a partial vacuum will be formed, " whereupon the debris, slush, &c. will flow into the lower " cylinder, and be there retained by the bottom valve." "A " joint in the frame permits of the lower cylinder being tilted " in order to empty its contents."

The inventor also describes a vessel made of lead or gutta percha or other suitable material, which, when filled with acid and lowered to the place where the acid is to operate, is opened by a valve rod and the acid allowed to escape to destroy the rock.

[Printed, 4*d*. No Drawings.]

A.D. 1858, October 6.—N° 2225.

BAYLIS, CHARLES.—Subways for water and gas pipes, &c.

A rectangular chamber or passage is constructed of cast-iron plates under the footway. There is an opening extending along the upper side closed with plates sliding in grooves, with key plates at intervals. This opening affords a means of access to the subway, and at the same time constitutes the kerb to the footway. If preferred, and the drawing shows this arrangement, a second subway may be attached to and run parallel with the first. This second way is under the street or roadway, and is intended to receive the gas and water pipes. Where branches have to be brought to the houses, they are brought through the first subway in small rectangular passages constructed at right angles to the second subway. These two subways may be constructed or secured together, or cast in one piece.

The subways may be made of flag-stones set in iron frames, if preferred, and glass plates may also be let into the frames to light the subway.

[Printed, 10*d*. Drawing.]

A.D. 1858, October 13.—N° 2280.

RIDLEY, ROBERT.—Safety cages.

The cage is fitted at its upper end with a pair of transverse parallel shafts, which shafts carry at each extremity an eccentric, there being thus two eccentrics on either side of the cage. These parallel shafts are also fitted with coiled springs, the tendency of which is to cause the eccentrics to grip the guides. This tendency is only restrained by means of lever arms and safety chains, so arranged, with regard to the winding rope, that in the case of the breakage of the latter the springs will immediately come into action, and by means of the eccentrics, sustain the cage.

[Printed, 10*d*. Drawing.]

A.D. 1858, October 27.—N° 2389.

LUIS, JOZÉ.—(*A communication.*)—Boring machinery.

The boring bar is provided near the bottom with grooves and ridges, capable of affording firm hold to a set of clips. These clips are carried at the lower end of what is called the "moving apparatus." This is a cylinder or tube which is capable of sliding up and down in a frame. Externally it is octagonal with a twist of 1½ inches to the yard. The external part passes through guides in the frame, like a screw through its nut, and the object of this is to give a turn to the boring tool at each stroke. The frame is suspended from a windlass by a rope at the requisite height, regulated according to the amount of fall required to be given to the tool. The octagonal clipping apparatus is similarly suspended from another windlass, but in this case it is wound up until the winding pinion disengages itself through a vacancy in the teeth and allows the rope to run out, when the clip runs back to the boring tool, which has previously been freed by the action of guides on the clips.

Various forms of tools are described, each being intended for a separate purpose, such as boring for samples, enlarging the drift, seizing and bringing up the boring bars, separating a core previously cut by a tubular tool, seizing a broken rope, &c.

The apparatus is described as capable of modification.

[Printed, 10*d*. Drawing.]

A.D. 1858, November 5.—N° 2477.

SCHWARTZKORF, LOUIS, and **PHILIPPSON**, FERDINAND CARL.—Improvements in machinery for boring rocks, &c.

" For this purpose a beam or girder is mounted on a bed " or carriage in such a manner as to be capable of assuming " an inclined position corresponding with the direction in " which it is desired that the hole should be bored. On the " face of the beam or girder a block is mounted which is " capable of sliding upon it from end to end; this block " carries a cylinder to which steam, or it may be compressed " air, is admitted by a suitable arrangement of valves, so as to " cause a piston, which the cylinder contains, to traverse continuously while the machine is at work, to and fro within the " cylinder. At each motion of the piston its rods strikes an " instrument placed below it, and which carries a cutting tool " of an ordinary description, and the end of the tool is thus " caused to penetrate the rock or mineral. Between each " stroke the tool holder is lifted by springs or otherwise, and " is turned partly round by the ratchet apparatus actuated by " the piston in its to-and-fro movements; as the work progresses the block is caused to slide on the beam or girder " to keep the tool up to its work."

[Printed, 10*d*. Drawings.]

A.D. 1858, November 5.—N° 2478.

DAVEY, Simon.—Blasting powder.

These improvements consist, "in the employment of flour, " bran, starch, or other glutinous or starchy matter to replace " a part of the charcoal now employed in the manufacture of " powder." Nitrate of soda may also be substituted for the nitrate of potash, but in this case the powder is placed in waterproof envelopes to preserve it from contact with the atmosphere.

The improvement further consists in methods of graining the powder. After the materials are mixed, they are made into a paste which is rolled into sheets and then cut into grains. Or the paste may be forced through sieves and the resulting threads dried and crushed.

The object of the invention is to reduce the quantity of smoke from combustion.

[Printed, 4*d*. No Drawings.]

A.D. 1858, November 6.—N° 2481.

PENRICE, Herbert Newton.—"Improvements in machinery " for tunnelling and driving galleries through rock and other " strata."

" The machinery is adapted for cutting a cylindrical gallery " or tunnel, and it is furnished with a cutter holder, or head " which carries a number of steel points or chisels on radial " arms, and is attached to the piston or plunger of a steam " or other engine." The cutter holder is driven to and fro by the movement of the engine. The steam is admitted to the cylinder by a balanced slide valve, or by other valves worked by a separate engine, and with or without multiplying gear. " The cutters are thus caused to strike the rock with a rapid " succession of short strokes and at the same time the cutter " holder is made to revolve slowly, by means of a worm wheel " and endless screw, or other gear driven by a ratchet, " actuated by the return stroke of the cutters or driven by " the small engine or engines, which also give motion to a " strong screw which works in a fixed nut and gradually advances the machine, which slides or moves on sleighs or " wheels fitting the curve of the rock. The screw can be " worked by hand when required. The nut is fixed on a " carriage or support, which is secured by pins inserted in " the rock, and which may carry two small machines with

" drills or chisels, which cut holes in the rock to receive the
" pins when the carriage is advanced, or these holes may be
" cut by hand. Under the machine is a bar supported by
" guides or rods, and carrying a series of blades or jointed
" flaps. This bar is moved to and fro by the engine or
" engines, and the blades rake out the chips or fragments of
" rock from under the machine."

[Printed, 1*s*. Drawings.]

A.D. 1858, December 2.—N° 2756.

ROGERS, Joseph.—(*Provisional protection only.*)—Ropes for mining and other purposes.

A number of yarns or cords or bands are laid together longitudinally so as to form a core, which is then served over with thread, or wire or suitable material. The rope is waterproofed by means of a mixture of boiled oil, resin, dryers, tallow, pitch, tar, or dissolved india-rubber, or some of them. " For mining purposes " moreover " any required number of " cables may be laid together side by side, by racketing, " weaving, pitching, or seasoning."

[Printed, 4*d*. No Drawings.]

A.D. 1858, December 3.—N° 2768.

VASSEROT, Charles Fréderic.—(*A communication from Mathias Welter and George Bohringer.*)—(*Provisional protection only.*)—Ventilating mines, &c.

The apparatus for this purpose "consists of a cylinder " formed of strong sheet zinc having an air passage attached " to its side, with valves opening out from or in the cylinder, " according as it is to be used for ejecting or injecting air; " to the one extremity of this chamber the hose or tubes are " attached which convey the air from or to the cylinder. In " each end or each cover of the cylinder is fixed a valve, opening inwards or outwards, as the case may be, and which " serve as the means either to expel or take in the air. The " cylinder has a piston and rod which works within it, the " piston having its face covered with a stuffing of india-rubber, " which is arranged so as to form two lips or rubbing parts, " and the space in the middle being bent or compressed hollow, " so that there is always a pressure upon the outer edges."

[Printed, 4*d*. No Drawings.]

1859.

A.D. 1859, January 5.—N° 42.

CORFIELD, William, the younger.—Chains for mining purposes, &c.

Instead of making chains of single links, as usual, it is proposed to make them "in double links, one set being a little " longer than the other, so that when any strain is applied the " short links only receive it; but should any of the short links " break or snap, either from wear or flaw in the manufacture, " the longer links then take the strain."

[Printed, 4*d*. No Drawings.]

A.D. 1859, January 6.—N° 50.

JOHNSON, John Henry.—(*A communication from Germain Sommeiller.*)—Rock boring machinery.

The tool is carried by a piston rod, the piston of which works in a cylinder by means of steam or compressed air. The reverse side of the piston is in constant communication with the valve chest, and consequently there is a constant counterpressure upon the reverse side of the piston in proportion to the differences between the areas of the two sides of the piston. This counterpressure always returns the drill for a fresh stroke. The piston rod is prolonged backwards through the rear of the cylinder, and is then fitted with ratchet gear to ensure rotation of the drill, and also with a spring clutch which is periodically thrown into gear and by means of a rack or screw advances the tool. It is thrown into gear by means of a stop on the drill, which, when the drill has advanced its length into the rock, lifts a detent from a rack, which detent again falls into the rack when the machine is sufficiently advanced. The whole apparatus is driven from a shaft set in motion by a steam or other engine. Apparatus is provided by means of which the whole drilling machinery is screwed back from the work when required.

The apparatus may be modified by attaching the moving cylinder to the percussive cylinder and dispensing with the second motion shaft. The pressure may be exerted alternately on the sides of the piston if desired, or the periodical pressure may bring the piston back, the constant pressure performing the other work. The apparatus may be simplified by using only a percussive cylinder and rotating the tool and working the valve by hand. It may be mounted on a pivot to work in any direction.

[Printed, 10*d*. Drawing.]

A.D. 1859, January 13.—N° 106.

BENNETTS, William.—Safety skips, &c.

The safety apparatus consists of projecting instruments which are capable of engaging with the guides and sustaining the skip or basket, but which are held back by the suspending tackle.

"In one arrangement the projecting instruments are at the " ends of two levers, to the upper ends of which the chain or " rope is attached, the lower ends of such levers having springs " applied thereto, with a tendency to force out those ends " when permitted so to do by the breaking of the chain or " rope, but so long as the chain or rope remains unbroken the " weight of the skip keeps the springs pressed back, and the " retarding instruments held out of action; or the projecting " instruments may be levers on axes, arranged in such manner " as to be kept pressed down by connecting rods or links, so " as to compress the springs as long as the skip, basket, or " apparatus is suspended."

[Printed, 8*d*. Drawing.]

A.D. 1859, January 21.—N° 197.

NEWMAN, James.—Chains for pit work and other purposes.

This invention applies to chains, the links of which are united by pins or rivets, and consists in forming the middle link with bosses projecting from the sides of the link around each pin or rivet hole, which bosses enter into corresponding recesses formed round the pin or rivet holes of the outer links; the pins or rivets serving merely to connect the links and not to take up the whole strain as to heretofore.

[Printed, 10*d*. Drawings.]

A.D. 1859, February 1.—N° 285.

PLIMSOLL, Samuel. — (*Provisional protection only.*)— Mining coal.

As a substitute for the pick, the inventor proposes the use of a "circular or a segmental saw centering in a saddle, which " traverses one, two, or more parallel rods of iron placed hori- " zontally for holing or undermining, and vertically for the " perpendicular cuts required for straight work."

The inventor also modifies the drill or jumper by which shot holes are prepared, by making a "screw thread upon its stem, " which shall work through a bush fixed in an upright punch " near the face of the coal; this will supply a fulcrum, and " give much greater force to the drill."

[Printed, 4*d.* No Drawings.]

A.D. 1859, February 2.—N° 298.

LANCASTER, Robert.—(*Provisional protection only.*)—Ventilating mines.

Instead of placing a furnace in the mine for the purpose of producing a current of air in the upcast shaft, the inventor heats the air by a furnace above ground, and blows it down into the shaft through clothed or jacketed pipes. The air escapes into the shaft through holes in a circular pipe or in any other convenient manner. By this method the risk of explosion is claimed to be diminished.

[Printed, 4*d.* No Drawings.]

A.D. 1859, February 7.—N° 347.

WILSON, John.—Ventilating mines.

Near the mouth of the downcast shaft is placed an air vessel or receiver, into which air is pumped. This receiver communicates with the workings in the mine by pipes fitted with regulating valves. Moreover, in the workings, lengths of flexible tubing, with mouthpieces, may be placed here and there along the air pipe, and to these the miners may resort for a supply of air in case of explosion or other accident. One pipe may be used to breathe from, another to supply a current of air around the man.

The apparatus may also be used to inject gases or mixtures of air and gases into the mine if necessary.

[Printed, 8*d.* Drawing.]

A.D. 1859, February 16.—N° 426.

BAILEY, SAMUEL.—Safety winding apparatus.

The winding rope passes through a ring or loop on a strong iron bar secured to the framing over the shaft. The rope is attached to the cage through the intervention of a catch apparatus, the action of which is as follows:—Should the cage be approaching too nearly the limit of danger from overwinding, the catch apparatus comes in contact with the ring and releases the rope, but at the same time two hooks forming part of the apparatus seize the ring and suspend the cage. In addition spring catches are fitted to the pit guides, which would of themselves prevent any retrogression of the cage.

[Printed, 1*s*. Drawing.]

A.D. 1859, March 12.—N° 635.

CALOW, JOHN THOMAS.—Safety cage.

The cage consists of two parts, the inner carrying the load. Outside the latter are levers which work brakes which grip the guides. The fulcra of these levers are borne up by springs secured to the other or outer part of the cage framing. Consequently, upon the rope breaking the whole weight of the load and inner cage is thrown upon the brake levers. Adjusting levers are fitted for the proper regulation of the brakes, and by them also a person in the cage may assist the action of the brakes by his own power. A perforated shield is placed above the cage to deflect the falling end of a broken rope, which, moreover, is also freed from the cage by means of a second or "check" rope, which comes into action on the breaking of the winding rope. Higher up another detaching hook is applied, which, in case of overwinding, comes in contact with a trussed bracket, and thereby releases the cage.

[Printed, 10*d*. Drawing.]

A.D. 1859, March 12.—N° 638.

ALLISON, RICHARD.—Apparatus for boring and sinking.

The boring tool is hollow, with a valve at bottom surrounded by the cutters. A door or trap is provided at the side on a level with the valve. For the purpose of raising the debris from the bore-hole a cylinder, with a valved bottom, is lowered into it, and a piston cylinder inside this cylinder is raised, whereupon the debris will pass into the cylinder, and may then be lifted out of the hole. The cylinder is reversed to empty it, the piston being removed. The inventor also provides a somewhat similar valved cylinder, but made of lead, gutta-percha, or some such material, for holding acid, which may be lowered into the bore, the valve opened by means of a cord, and the acid allowed to flow out.

[Printed, 8*d*. Drawing.]

A.D. 1859, March 15.—N° 653.

CLARK, William.—(*A communication from Victor Louis Marie Serrin.*)—Electric light in mines, &c.

"This invention relates to an improved regulator for an " electric lamp, which has for its object to form and determine " the voltaic arc or passage of the current between the electrodes as soon as the circuit of the battery is made in which " it is introduced. The arc when once formed maintains itself " during the gradual wearing or consumption of the charcoal " points, so as to compensate for the wear, in order to produce " a regular light. This approach of the carbon is, besides, " effected according to the relative wear of the carbons, so as " to maintain the light in one uniform position, whereby the " circuit can also be broken or re-established as often as it is " wished."

Amongst other uses for this apparatus, it is claimed to be of value in mines, where it may be enclosed in a hermetically sealed glass globe or shade, so as to be inaccessible to the air of the mine, or in a shade dipping in a trough of water. It may also be used, unprotected, for the purpose of ascertaining the state of the air in mines before the men go into the workings.

It is also applicable to the illumination of railway tunnels, the trains making and breaking the circuit.

[Printed, 10*d*. Drawings.]

A.D. 1859, April 5.—N° 857.

LIBOTTE, Nicholas.—Safety cage.

"The invention consists of a safety apparatus in which " claws, grips, or jaws are mounted upon shafts, which are

" capable of being turned to the required extent by means of " vertical or horizontal springs on such springs being released " by the breaking" of the rope. The parts "can be arranged " in such manner that while the chain or rope is taut," "its " effect would be to exert tension upon or stretch the spring " or springs when vertical springs are used, or to compress the " springs when horizontal ones are used; or to act on both " simultaneously when both vertical and horizontal springs are " employed, *i.e.*, stretching the former and compressing the " latter; but immediately on the rope or chain slackening or " giving way the springs are set free, and act through intermediate appliances on the jaws or grips, causing them to " catch, clip, or hold the shaft-guides with a degree of tenacity " proportionate to the weight or load and acquired velocity."

The drawing shows a number of applications of this principle to mine cages.

[Printed, 8*d*. Drawing.]

A.D. 1859, April 19.—N° 987.

DUTTON, Isaac, **MARTIN**, Robert, and **PHILLIPS**, Thomas.—Preventing overwinding.

The machinery for this purpose consists of "a screw on " which a wheel is made to advance by the rotation of the " drum shaft of the mine engine, which said wheel having " advanced to a certain distance in either direction upon the " said screw engages with a clutch, whereby an ordinary brake " attached to the engine is brought into operation" by means of a crank on the end of the screw shaft. The wheel which travels over the screw is toothed, and is driven by a pinion equal in length to the screw. Apparatus is provided by means of which the brake is removed from operation when not required to be used.

[Printed, 8*d*. Drawing.]

A.D. 1859, April 28.—N° 1068.

LIBOTTE, Nicholas.—Mine brake.

A brake wheel is fitted to the drum shaft, and this wheel is acted upon by brake bars arranged in framing so as to press the sides of the wheel between them. The sides of the wheel are roughened or grooved, and the bars are similarly prepared. " The bars are connected by links, jointed arms, or lazy-tong

" action to the piston rod of a steam engine cylinder," by which they may be operated. At their other ends the bars are hinged or connected to supports. " The brake may be worked " by hand, by prolonging the piston rod through the farther " end of the cylinder, and attaching it to a lever handle. An " upright, with shaft, studs, and levers may be added to open " the brake slide and close the slide of the hoist or winding " engine when the cage is at the requisite point."

[Printed, 8*d*. Drawing.]

A.D. 1859, May 17.—N° 1226.

DE TRETS, Amédée Etienne Charles Joseph Reynaud.— " Composition for splitting rocks."

" The composition is formed of nitrate of soda, spent tan, " and powdered sulphur, in the proportions of 52·5 parts of " the soda, 27·5 parts of the tan, and 20 parts of the sulphur " prepared in the following manner :—Dissolve the nitrate of " soda in a sufficient quantity of water over a fire, and boil ; " mix the tan in the solution until every portion is impregnated with it, and then the sulphur in the same manner. " Remove the composition from the fire and dry it," after which it is ready for use.

[Printed, 4*d*. No Drawings.]

A.D. 1859, May 18.—N° 1232.

EVANS, Samuel Norton.—Preventing over-winding.

The winding rope is attached to the cage through the medium of a safety apparatus. The end of the rope is fastened to a bar retained in the apparatus by two bolts. Two arms or levers project from the apparatus, and their action is such that they, coming in contact with a ring on the framing, through which ring the rope passes, draw the bolts out from the bar, and so release the rope from the cage, the bolts at the same time being drawn out sufficiently to project over the ring and so suspend the cage.

[Printed, 8*d*. Drawing.]

A.D. 1859, June 9.—N° 1402.

BURNESS, William.—Improvements in steam culture.

Part of this invention relates to the construction of winding drums, grooved and plain drums for wire bands, in which steel springs or other elastic materials are used "for the purpose of "distributing unequal force, so as to equalize the tension of "the wire rope or band. They may be made in various forms, "and introduced into drums in so many different ways as "almost to preclude specification." The patentee, however, describes one method of using the springs in this way in a cultivating machine. "Springs of steel or other elastic "materials may be in a similar manner introduced into drums, "fly wheels, rope pulleys, and toothed wheels for actuating "straps, bands, ropes, chains, and toothed wheel machinery "when subject to irregular force, such as are employed in "connexion with traction engines," &c., and "with hauling "apparatus in collieries, and such like."

[Printed, 1*s*. No Drawings.]

A.D. 1859, July 20.—N° 1705.

GEDGE, William Edward.—(*A communication from Mr. Fontaine.*) — (*Provisional protection only.*) — "A mining "parachute."

The following is the inventor's Provisional Specification :— "Several parachutes and other apparatus have been proposed "and tried for the purpose of preventing the fall of a cage or "platform in the event of breakage of the cable, but hitherto "with little success. I propose to obtain the desired result "by the use of an apparatus or mining parachute to be constructed as follows :—An iron summer or cross piece is "fixed at a suitable distance from the upper framing of the "cage by three flat iron bars which form fastening to an iron "covering plate. Two rods pass through the first mentioned "cross piece, and also through a grooved cross piece formed "by plates and ties which guide the rods, and serve for fulcrum to arms hinged at one end to the rods and which "are furnished at the other end with case-hardened claws, "destined in case of breakage to the cable to penetrate into "the guides or uprights, and are assisted in this by helical "springs which draw down the rods; nuts are screwed on the "ends of the rods to fix and give the necessary tension to the "springs, which should be of the best steel wire, and should "consist of ten or eleven spires, slide boxes keep the springs "in a proper position, and in case of breakage, keep the "spires superposed, so that they act in every case. The

" guides run from top to bottom of the shaft, and are bolted
" to wood fixed in the masonry or side of the shaft, two half
" circles of iron serve as attachments to the cage and cable.
" An iron shaft held by a pair of cast-iron supports fixed to
" intermediary guides carries an arm which is at its other end
" attached to bolts. A lever fixed on the iron shaft, and
" carrying a balance weight when lifted withdraws the bolts,
" permits the summer or cross piece first mentioned to de-
" scend, and the fall of the cage is arrested by lowering the
" lever. The apparatus resumes its original position, and the
" cage may be raised or lowered at pleasure."

[Printed, 4*d*. No Drawings.]

A.D. 1859, August 19.—N° 1907.

JACKSON, John, and THORLEY, Joseph.—Safety cage.

For this purpose inclined planes are employed, which cause rollers or other apparatus to act as a lock upon the cage.
" To the rope are connected by means of levers two rollers on
" either side of the cage, and between which are situated
" fixed rails; these rollers are kept back from the rails by the
" tension of the rope, but should it break, they turn into
" contact therewith and become wedged thereto by inclined
" planes attached to the cage."

[Printed, 6*d*. Drawing.]

A.D. 1859, September 24.—N° 2173.

OPIE, Joseph.—(*Provisional protection only.*)—Charging holes in blasting.

For this purpose a tube and piston are used, the tube being of a size and length suited to the hole. A disc of card is cut to close the end of the tube, but large enough not to be drawn into it. To this is attached by a thread the end of the fuse which is inserted in the tube. Powder is then filled in the tube, and a wad, with a notch cut in it to allow for the fuse, placed upon it. The piston and its rod are then inserted, the piston being similarly notched. The apparatus is then placed in the hole and, by pressing the piston and withdrawing the tube, the charge is transferred to the hole and is then tamped. The wad is constructed to be easily expanded, and is preferably made of a mixture "of rosin and pitch and tar, with a
" coating of fibrous substance on the flat side or sides, and

" bound with paper on the circumference." The tube may be dispensed with in the case of vertical holes.

[Printed, 4*d*. No Drawings.]

A.D. 1859, September 30.—N° 2212.

GUIBAL, Théophile.—"Working mine cables."

This invention consists in "the introduction of springs or " elastic apparatus beneath the pulleys of mining or other " cables, or within the drum or bobbin round which they roll, " for the purpose of protecting the cable against the damage " caused by sudden tension, and the machines from the destructive effects of sudden shocks."

It also consists in an arrangement of machinery "for instantly arresting the machine when any unanticipated " resistance is experienced." If the load or effect on a pulley should pass the prescribed limit, the springs bend, a small lever is lowered which causes another lever to escape, and a falling weight exercises a traction upon a rod which puts on a brake, and may also shut off steam if required.

[Printed, 10*d*. Drawing.]

A.D. 1859, October 1.—N° 2234.

WRIGHT, Joseph.—Raising water and minerals from mines.

The bucket or cage or platform is attached to one end of a piston rod extending down the shaft. This piston rod works in a cylinder with a stroke equal to the lift required. The bucket is fitted with inlet valves, and is capable of being reversed or swung to empty it. The cage works in guides. The cylinder is made up in sections or rings, and the piston rod may be tubular and similarly constructed.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1859, October 6.—N° 2272.

SCOTT, John Peers, and SCOTT, Edward.—(*A communication from Constantin Von Longinoff.*)—(*Provisional protection only.*)—Boring tool.

"The instrument consists of a centre portion, which is wedge-" shaped or slightly curved, and two cutting edges; the centre " portion projects beyond the cutting edges. When the " instrument is in operation it must be struck by a hammer " and turned gradually round."

[Printed, 4*d*. No Drawings.]

A.D. 1859, November 9.—N° 2550.

SPILL, George, and **SPILL**, Daniel.—Bands for mine cages, &c.

Strips or wires of steel or other metal are covered with strands of hempen cord previously saturated with some preservative composition, and are then rolled to solidify the covering. These strips are then heated as warps in a loom, and woven together into bands by fibrous strands. The band is then rolled and coated with some preservative, as for instance, caoutchouc or paint.

[Printed, 4*d.* No Drawings.]

A.D. 1859, November 23.—N° 2649.

HUGHES, Edward Thomas. — (*A communication from Nicholas Rave, the elder.*)—Substitute for blasting powder.

A mixture of eighty parts of carbonate of potash, thirty parts of ground straw, and fifteen parts of anthracite mixed into a thin paste with water, is treated in a Woulf apparatus with "a current of acid gas, produced by the peroxyde of "manganese and hydrochloric acid" (chlorine). The mixture should be kept from contact with the air, and dried in a current of the gas. Ordinary pit coal may be used instead of the anthracite.

[Printed, 4*d.* No Drawings.]

A.D. 1859, November 23.—N° 2651.

HUGHES, Edward Thomas. — (*A communication from Nicholas Rave, the elder.*)—Substitute for blasting powder.

This powder consists of a mixture of chlorate of potash and charcoal, or wood dust, or coal. The components are mixed into a paste with water or gum water, or the salt is mixed as a solution with the carbon, and evaporated down to a paste. The paste is dried and ground.

The average proportions are described as 100 parts of vegetable matter or carbon, and 200 parts of chlorate of potash.

[Printed, 4*d.* No Drawings.]

A.D. 1859, November 23.—N° 2656.

KNOWLES, John.—(*Provisional protection only.*)—Preventing overwinding.

This invention relates to improvements upon the apparatus for which the inventor received Letters Patent, dated 14 October 1856, (No. 2401).

"The invention consists in the use of a pair of lever-like "arms, each having a fulcrum or centre of motion about the "middle; one of these arms is furnished with a projecting "and hinged stud or pin, the opposite arm having a hole to "receive such pin, and upon such arm is secured a smaller "lever, governing a pin bolt or 'cotter.' When the weight "is suspended or being wound up, the hinged pin is inserted "in the hole and 'cotter' passed through a hole in the hinged "pin, and thus a firm joint is effected; but when the weight "has attained the required position, the lower diverging parts "of the levers strike against the bearings of the winding "pulley, whereby the small 'cotter' will be withdrawn from "the hinged pin, and the said pin withdrawn from the hole in "the arm, and thus the weight is instantly detached from the "rope and winding power."

[Printed, *4d.* No Drawings.]

A.D. 1859, December 6.—N° 2757.

COIGNET, François.—An improved beton.

This beton is claimed to be useful, among other things, in the construction of drains, conduits, culverts, sewers, supports for mine galleries, tunnels, arched ceiling for subways, "longitudinal passages being provided in the thickness to form "fluid-tight channels for gas, water, &c., instead of the tubes "now used," &c.

The chief feature in the invention is the reduction in the quantity of water required in mixing the materials of which the beton is composed. The lime, which may be used within a few hours after burning, is slacked with the least possible quantity of water. It is then reduced to a firm plastic mass, and the slacking, if not previously entirely effected, completed by grinding with a very small quantity of water by machinery. The remaining constituents of the beton, before being mixed with the lime, are dried as much as possible, and this drying, together with the use of natural or artificial puzzolanas, moderates the excess of moisture. Irregular fragments of iron and double-headed nails may also be mixed in, to serve as binding agents. The mixing and pressing is thoroughly effected by mechanical means.

The inventor also claims the employment in beton, having lime for its base, "of cements in proportions much less than " hitherto, and never exceeding $\frac{1}{10}$th part of the mass, and " sometimes not over $\frac{1}{20}$th or $\frac{1}{30}$th."

He bases his improvement on the theory that the quality of lime betons depends on the crystallization of the lime rather than on chemical combinations, and that such crystallization is brought about by dispensing with a large proportion of the water of admixture usually employed.

[Printed, 6*d*. No Drawings.]

1860.

A.D. 1860, January 2.—N° 5.

JACKSON, William.—(*Provisional protection only.*)—Coupling for preventing overwinding.

The attachment of the cage "acts direct in a vertical direc- " tion, as though the connexion were a simple bar, but is " capable of being readily liberated. To the link, which is " attached to the rope or chain," is connected "a jointed part " having a recess, within which is situate a pin carried by a " link, from which the cage is suspended; this jointed part " is closed upon the said pin by its aid being confined within " a cross bar. Should, however, the cage be wound too high, " this cross bar is forced downward by a stationary piece, and " the cage is liberated; beneath the cross bar" there is adapted "a spring to keep it in place when the rope or chain " is slack."

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 5.—N° 29.

ST. JUST, Louis Armand le Blanc de.—(*Provisional protection only.*)—Quarrying machine.

"The machine moves on iron rails, and cuts the stone by " means of twelve pickaxes about 30 inches in length; they " are bolted to a cast-iron plate of 60 inches in diameter;

" these plates are five in number. The boiler is tubular, and " is furnished with cylinders, the connecting rods of which " act on the same shaft with a double crank. Two pullies on " this shaft communicate the movement to two other pullies, " the shaft of which is held by two supports on windlasses " placed in front of the machine; the same shaft carries two " pullies, communicating movement to two others fixed on " the shaft, and bearing the five plates, each armed with " twelve pickaxes as above shown. The machine when placed " on the rails runs from one extremity of the quarry to the " other, cutting the stone in a straight line; on arriving at " the end it is made to go back, the rails being placed obliquely, " so that on arriving at the side it began at it is in position to " commence a second cutting. On the windlass above men-" tioned two cords are rolled, and which pass on a pulley fixed " at the opposite end of the quarry to that the machine starts " from; the shaft held by two supports on the windlasses " bears also two excentrics, whose rods govern two half iron " hoops furnished with a groove, by means of which the ampli-" tude of their oscillations is increased according as the rods " are placed more or less near the centres of oscillation. The " half hoops have each at their lower part a catch which " governs a ratchet wheel fixed on a shaft bearing two endless " screws, one having the worm to the right, the other to the " left; each of these screws gears with a wheel with heli-" coidal teeth fixed on the shaft of the wooden drums, forming " the windlasses, forces each to turn, and the two ends of the " cord winding up, the machine is obliged to advance, drawing " as it does on a cord fixed at the other end of the quarry."

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 16.—N° 113.

COPE, William Sherratt.—(*Provisional protection only.*) —Preventing overwinding.

"The apparatus for connecting the end of the rope or chain " to the cage or skip consists of a pair of hooks, the points of " which pass through the eye or link or ring at the end of the " rope or chain in opposite directions. These hooks move in " a circular groove, and are prevented leaving hold of the " chain or rope by a spring or springs by which the hooks " are retained securely within the eye or link or ring" "till

" such spring or springs is or are pressed on by a sliding " cylinder or instrument, which by the further ascent of the " rope or chain is pressed up against a fixed cross head through " which the rope passes, but which prevents the cylinder or " instrument passing." Sliding bolts may be similarly employed in connecting the rope. Two flaps, which will open upwards to allow the cage to pass, fold down under it and sustain it after the rope is released.

[Printed, 4*d*. No Drawings.]

A.D. 1860, January 20.—N° 144.

TIMMINS, JOHN.—Safety cages.

The cage is made "somewhat of the usual form, with guides " for sliding over the conducting rods." Over it is placed "a " cover formed of an elastic steel plate, which during the " hauling up or lowering of the cage will yield to the drag of " the weight, which it assists in suspending, but in case the " hauling rope should break will throw into action a set of " catches which will gripe the vertical conducting rods, and " hold the cage in suspension. The coupling of the cage or " hoist with the hauling rope is effected through the intervention of a jointed or expanding hook, the tongue of which " enters the metal eye of the hauling rope. Lateral projections are formed on the coupling hook for the purpose (in " the event of the cage being raised too high) of being pressed " upon by the ends of a stationary taper guide, and causing " the hook to open and release the eye of the hauling rope."

[Printed, 8*d*. Drawing.]

A.D. 1860, February 14.—N° 402.

NEWTON, WILLIAM EDWARD. — (*A communication from George Colhoun.*)—Apparatus for producing currents of air in mine shafts, &c.

An upright throat is fitted to the shaft or chimney and upon this placed an elbow piece, the mouth of which is capable of being turned from the wind by means of a vane. This elbow piece is surrounded by a funnel made up of two truncated cones placed truncated end to truncated end, their junction being level with the mouth of the elbow and leaving an annular space around it. The wind, in passing through this funnel, draws the air out of the elbow and this draught is increased by fitting a trumpet mouth at the back of the elbow, and therefore facing the wind, so as to allow a jet of the latter to travel with the exhaust air along the horizontal limb of the elbow. An artificial draught may be produced by using ste

[Printed, 8*d*. Drawing.]

A.D. 1860, February 23.—N° 492.

GILBERT, SAMUEL.—(*Provisional protection only.*) — "A " new machine for excavating sewers, tunnels, and other such " like underground work."

"The objects of this invention are to excavate sewers, " tunnels, and almost any kind of underground work, and at " the same time allowing the building of the required number " of rings of brickwork without the use of timber to prevent " the slip from above." The inventor says, "I propose " employing a cutting shield of the form of the upper part " of the tunnel or sewer, and supporting it by suitable framing, " upon which are powerful screw jacks, hydraulic presses, or " other suitable power, for the purpose of driving said shield " forward. The shield travels over rollers on the top of the " frame, and can be made to travel in a straight line, rise, " fall, or turn a course by means of such rollers. The bearing " prop or framing at the back of the brickwork may be " formed in the shape of an X; the lower part thereof serving " as an entrance passage to a waggon road, where such is " required."

[Printed, 4*d*. No Drawings.]

A.D. 1860, February 24.—N° 497.

BOISSAU, FRANÇOIS.—Raising minerals.

"The apparatus consists of four rods placed in the" shaft, " two of which serve for the ascent of the cage and two for the " descent. These ascending rods have a to and fro movement " imparted to them by means of a double rack, one side of " which works in connection with the segment of a cogwheel " formed upon the arm of a balance lever," worked by steam or otherwise. "The opposite side of the rack is in connection " with a pinion placed between the rack on the ascending rods " and the rack on the descending rods," so that one pair of rods ascends while the other descends, the latter being counterbalanced. "The ascending and descending rods are "provided with a series of catches or supports working on "suitable axes and arranged at about three yards apart, such "catches being for the purpose of holding the cages while "being raised. There are also other similar supports fitted "and working upon stages" in the shaft, "and having also "their axes upon a bar which passes through them. The "cages upon being drawn up by the rods come in contact with "the catches or supports and raise them up, and immediately "the cages have passed the catches fall and allow the cage to "rest upon them. The cages are then raised by the rods a "distance of about three yards at each stroke. The descending "side of the apparatus is worked in a similar manner, but is "provided with a cam and levers connected to the rack for "keeping the catches or supports up and out of the way while "the cages are descending." Trucks are provided at the pit mouth for working the cages. Water may also be raised by this apparatus.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1860, February 25.—N° 514.

HUGHES, Edward Thomas.—(*A communication from George Kolb.*)—Boring apparatus.

This apparatus "consists of attaching to the ordinary borer "a wire cable, twirl, and a spring, so that when the twirl is "turned partially round, it turns the borer in the earth, and "then returns or turns back again by the power of the spring "and wire cable, thus forming a partially self-acting borer; "the said spring forming a brake to regulate the return of the "wire cable."

[Printed, 6*d*. Drawing.]

A.D. 1860, February 28.—N° 542.

WALKER, Robert.—Disengaging hooks for mine cages.

When the cage is being raised, the bridle, by which it is suspended hangs securely in the hook and is further retained by means of a catch and spring. Should the hook reach the winding drum, it becomes slightly inclined, and at the same time a shoulder on the shank of the hook being pressed inwards, releases the catch and allows the bridle to escape. The cage is then held suspended by retaining palls. A modification of this hook is described, and it is also remarked that similar results may be attained by the "use of two plates or bars, one of which "is connected to the winding on chain or rope, and the other to "the cage; these bars are connected together by a shoulder "on one entering a recess in the other; the two bars are held "in contact by a spring; when this apparatus is raised until "it comes in contact with the head gear pulley" or other projection, "a spring catch is pressed against the projection above "referred to, and separates the bars, thus liberating the cage."

[Printed, 6*d*. Drawing.]

A.D. 1860, February 28.—N° 544.

WRIGHT, Zaccheus.—Safety winding apparatus and disconnecting gear.

"The apparatus consists of two plates" one "on each side "of the guide rods, and so arranged as to slide thereon; between which plates are placed two bell-crank levers, which "are connected thereto by strong bolts or studs on which they "oscillate. The levers are so arranged that their shorter ends "grip or act against the guide rods, the long ends being connected to the chair or cage, and by the leverage thus obtained "the chair will be immediately stopped in its descent on the "breakage of the rope. When the apparatus is ascending or "descending the shaft, the longer ends of the levers are raised "by the tension of the rope, and the short ones removed from "contact with the guide rods, but should the rope or chain "break, the said levers are brought into action by their own "gravitation which is quickened by the aid of springs. Connected with this apparatus is a lever, which may be operated "by any person in the chair so as to stop the chair at any "time."

The cage is attached to the winding gear by means of a bolt held in position by pins attached to short bars. These bars are preserved in a firm position by means of levers pressed outwards by springs. Should the cage be overwound these levers, in attempting to pass through a ring fixed in the frame, become compressed, and, pressing in the short bars, draw out the pins and release the cage.

[Printed, 10*d*. Drawing.]

A.D. 1860, February 29.—Nº 557.

WILLIAMS, William.—Ventilating machinery.

Each exhausting cylinder is of large diameter, built up of cast-iron rings and provided with a light wrought iron piston. At the top and bottom of each is a chamber fitted with inlet and outlet valves, so that at each stroke air is drawn in on one side of the piston and expelled on the other. The inlet culvert, from which the air is drawn, is made to connect them all together, and the air is discharged directly into the atmosphere. The pistons are worked by steam engines connected directly or indirectly in various ways.

[Printed, 10*d*. Drawings.]

A.D. 1860, March 6.—Nº 616.

BUXTON, William.—Safety cages.

Two bell crank levers are bolted to the floor of the cage on both sides. These are fitted with springs for drawing the long arms of the levers towards a horizontal line, when they are not held back by the strain of the suspending chains attached to their short arms, and so gripping between them the pit guides.

The invention may be applied in cases where round rope or iron conductors are used, a slight modification in the form of the lever ends being only necessary.

[Printed, 6*d*. Drawing.]

A.D. 1860, March 10.—Nº 647.

LUIS, Jozé.—(*A communication from Charles Honoré Hypolite Lepetit.*)—(*Provisional protection only.*)—" An " improved means of blasting rocks."

The invention consists "in replacing the small holes of " mines, usually cylindrical, the size of which can only vary " slightly, by mines variable in size and depth, according to " the results required." The inventor constructs the mines " with what may be termed pockets" or chambers. " The " tool used for chambering the mines is of extremely simple " construction; it is composed as follows :—A compresser in " which a hole is pierced, in order to fix a stud or pivot, by " means of which it is guided along the groove of the cheeks " placed at each side of it and united at their upper extremi-

" ties by a ring, in which two rests are made to fix each side
" the claw of the cheeks, one being furnished with a stop
" soldered to it, the other with a stop screwed in the claw of
" the cheek, so that when the instrument is taken to pieces this
" stop is unscrewed, and on turning the ring slightly the two
" stops thus become placed before two grooves made in it,
" when they can be easily removed from the upper part of the
" cheeks; at the lower part of the cheeks a screwed hole is
" made in which a tie piece is fixed at each end; it is of steel,
" and is screwed in each cheek and rivetted on one, so as to
" leave free play to the blade which receives the blow of the
" compresser; a groove is made on the blade, so that it may
" slide freely backwards and forwards in the tie piece, and
" also place itself horizontally in the pocket. At the lower
" part of the blade a hole is pierced to admit a bolt fixed at
" the lower end of an iron or steel rod, which passes along
" the cheeks and in the ring, and then along the compresser.
" At the upper part of the rod a weight of iron rests, so that
" when the compresser strikes the upper part of the slide of
" the cheeks, the rod with its weight causes the blade to place
" itself vertically, so that no difficulty is experienced in turning
" the blade in the hole when the blade has to be cleaned.
" The blades are made of steel, and tempered to suit the hardness
" of the rock; they increase in size according as the
" hole enlarges."

[Printed, 4*d*. No Drawings.]

A.D. 1860, March 22.—N° 742.

CRAWSHAY, George.—Iron winding pulleys.

The invention "consists in constructing the rims of such
" pulleys of wrought iron instead of cast iron." "These rims
" may be made either of iron rolled to a particular section
" suitable to the purpose required, or the section thereof may
" be made up in parts. For this purpose ordinary angle iron
" may be used for rims for round ropes, and channel iron for
" flat ropes, but the sectional form of the iron may be varied.
" When the section of the rim is made up in parts, the body
" or barrel thereof may be formed of flat or square iron, and
" the flanges or sides secured thereto by rivets or bolts."

[Printed, 6*d*. Drawing.]

A.D. 1860, April 9.—N° 888.

BIEHLER, Gustave. — (*Complete Specification, but no Letters Patent.*)—"Improved apparatus to be employed for "blasting rocks, and the application of the same to the formation of tunnels."

The invention relates, firstly, to an improved cartridge, the object of which is "to obtain a greater explosive force than "has hitherto been obtained with cartridges of the ordinary "construction. This is effected by constructing the cartridge "in such a manner as to leave a space all round it between "the aperture bored in the rock and the case containing the "powder, by which means increased explosive effect is pro-"duced by the sudden expansion of the air confined in such "space when the powder is ignited." The tunnelling operations are effected by blasting the rock in a system of successive and gradually increasing arches, or the work may be done "by "first removing or shaping the dome by means of several "charges of the larger cartridges and descending to the level "of the rails by a series of steps formed by means of" smaller cartridges. The arches may be formed in two ways, "First, "by means of cartridges acting in front parallel to the axis of "the tunnel," or "Second, by causing them to act throughout "the whole length of the arch by means of cartridges per-"pendicular to the axis, and which latter method is the most "expeditious."

[Printed, 6*d*. Drawing.]

A.D. 1860, April 12.—N° 913.

WEBB, John.—Blasting cartridges.

The cartridge is made of cloth, waterproofed by means of boiled oil, india rubber or other like substance. The mouth is tied round the fuse. A "bunch of cow hair, flannel, or other "similar loose woollen material" is used "as a wadding be-"tween the tamping and the charge." This is intended to prevent the fire from the fuse smouldering, in the event of the direct fire failing to reach the charge.

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 12.—N° 915.

ADDENBROOKE, George, and LEWIS, Frederick. — (*Letters patent void for want of Final Specification.*)—Safety winding apparatus.

This apparatus is so contrived that upon the cage reaching a given height above the pit mouth, the frame upon which the pulley is mounted, is caused to retire with the cage from the top of the shaft, and as soon as it has reached a fixed spot this frame is secured by a catch, at the same time shutting off steam if desired. To prevent accidents from breakage of the rope, levers are fitted to the top of the cage which open out on the occurrence of a breakage and sustain the cage in the shaft. The pit mouth may be fenced round when this winding gear is used.

[Printed, 4*d*. No Drawings.]

A.D. 1860, April 25.—N° 1040.

TARTE, Xavier, and TOOVEY, William.—Iron structure for tunnels, &c.

Part of this invention relates to an iron framing which is claimed by the inventors as offering a most economical means " of "spanning tunnels," &c. It consists of two plates of metal kept apart and stiffened by a number of other plates bent to angles of about 60°, "of which the apices meet alternately " with the upper and lower plates to which they are strongly " fixed by rivets." The lower plate may be replaced by bands of metal.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1860, May 22.—N° 1264.

PATON, John.—Apparatus for boring and winding.

The boring tool is suspended from one end of an arm carried by a rocking shaft properly supported upon pedestals. The other end of this arm is reciprocated by means of antifriction rollers fitted in radial grooves in a wheel driven a steam engine. By means of these rollers the amount of reciprocation may be adjusted, according to the nature of the work. Spring buffers, air cylinders or applications of hydrostatic pressure are used to modify the force of the blows and to take up the weight of the rods. A winding drum is placed on the shaft of the wheel which actuates the boring arm. Frictional gearing is described as being used for working the apparatus, but spur gearing may be substituted.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, May 31.—N° 1342.

FARRELL, William.—(*Provisional protection only.*)—Preventing accidents from overwinding.

The hook by which the cage is suspended has an extension, which when it is raised too high comes in contact with a fixed stop, causing the hook to cant and slip the cage out of the hook. Palls or stops are placed in the guides, and in case of accident, bars fitted to the sides of the cage, when the latter is released, project catches which engage with the palls and sustain the cage. In the hook there is fitted a wheel, which fills it entirely, and is free to turn on the lower part of the bridle. It has a notch in it to receive the ring of the cage bow, which wheel prevents it being thrown out.

The invention also relates to a kind of S-hook fitted with springs, by the use of which the rope frees itself from the cage, if broken, and falls past it.

[Printed, *4d.* No Drawings.]

A.D. 1860, June 12.—N° 1439.

FROMONT, Phillippe.—(*Provisional protection only.*)—Raising and lowering in mines.

Series of toothed wheels are placed in the shaft extending from top to bottom. These wheels are worked from the top by means of a pair of rods and cranks on the axes of the wheels. The cage is provided with racks which engage with the toothed wheels and according to the direction of rotation of the latter the cage is raised or lowered.

[Printed, *4d.* No Drawings.]

A.D. 1860, July 11.—N° 1673.

DAVIS, John.—Preventing overwinding.

The invention "consists in attaching toothed racks on both
" sides the " shaft top, "and the employment of a 'gamborine'
" or frame of iron working in such racks. To this 'gamborine'
" the cart or skip is suspended by chains. A box of metal
" containing a releasing spring is attached to the bottom of
" the winding rope." "In winding up the skip the rope
" proceeds smoothly over the pulley until the spring box
" comes up to the pulley." "The box is then tilted and the

" spring brought into action, releasing the skip chain and " leaving the 'gamborine' or frame to which the cart or skip " is suspended securely resting in the teeth of the rack. The " spring box passes on with the" "rope; and it is caught by " a suitable frame."

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1860, July 20.—N° 1758.

DICKINSON, Joseph.—Brakes for winding gear, &c.

Upon the revolving shaft of the machinery are fixed a fast and a loose pulley. A strap or cord connected with the brakes passes round the pulleys, and is traversed laterally from the fast to the loose pulley or vice versa. When it is required to put on the brakes the strap or cord is moved from the loose to the fast pulley, thereby causing the brake to be drawn against the wheel. When free the brakes hang clear by their own gravity, or they may be furnished with a counterpoise.

[Printed, 4*d*. No Drawings.]

A.D. 1860, August 4.—N° 1892.

HUNTER, James.—Boring and winding.

This machinery is worked by a portable engine. A spur wheel on the driving shaft communicates motion to another shaft furnished with cams. These cams act on the back end of a rocking lever, to the other end of which the boring tool is suspended. When a differential cam is used the stroke of the tool may be regulated by shifting the cam more or less along the shaft. A weight box is also fitted to the back end of the rocking lever and is adjustable thereon for the purpose of regulating the force of the blow.

By another arrangement a cam is fitted to the driving shaft of the engine and this works the rocking lever through the medium of another lever, by means of which the stroke is adjusted.

For raising or lowering the boring rods a winding barrel is fitted loosely on the crank shaft and thrown in and out of gear by means of the usual coupling.

[Printed, 10*d*. Drawing.]

A.D. 1860, August 8.—N° 1914.

BROOMAN, Richard Archibald.—(*A communication from Hippolyte Amédée Buequet Raouel Jacques Marie Destrem, and Jean Baptiste Valauri.*)—"Excavating machine for boring "tunnels and performing other excavating operations."

"This machine consists of a strong under carriage or bed "mounted on wheels or rollers, upon which a frame carrying "an engine gear work, and the excavating tools . . . . is free "to be moved to and fro. The excavating tools consists of a "series of circular frames, wheels, or discs carrying on a "portion of their circumference moveable teeth or chisels. "These tools act as circular saws; they are keyed on the same "shaft, say, to the number of five, more or less, with a space "between every two. The engine is worked by preference "with compressed air. . . . . As fast as the saws cut their "way so is the frame advanced until they have penetrated to "nearly one half of their diameter; the whole machine is "then drawn back, and the portions of rock or earth between "the saw cuts are readily knocked out by levers, wedges, and "other suitable tools, and removed."

[Printed, 10*d*. Drawings.]

A.D. 1860, August 9.—N° 1935.

NEWTON, Alfred Vincent. — (*A communication from Sidney Mason Stone.*)—Ventilating mines.

A foul air duct leading from the mine to the surface is heated by a flue passing upwards through it, so that by rarefying the air within the duct an upward current is created within it. The flue communicates with a stove placed on a platform under the duct. A downcast pure air duct leads into the mine.

[Printed, 8*d*. Drawing.]

A.D. 1860, August 23.—N° 2030.

LILLIE, Sir John Scott.—Blocks for sewers and tunnels, &c.

The inventor takes "stone, flint, broken bricks, clinkers, or "other hard material," and unites "the same by bituminous "compounds or other cements, cast in moulds of such form, "shape, or size as may be required, being rectangular for "perpendicular walls, and in segments of circles for arches, "sewers, tunnels, &c."

[Printed, 4*d*. No Drawings.]

A.D. 1860, September 8.—N° 2178.

DUVERGE, Jean Baptiste Frédéric.—(*Provisional protection only.*)—Boring machinery.

A metal framing supports two parallel shafts, one solid, the other hollow. By means of winch handles and bands the former drives the latter. The latter is hollow, and has within it a " spherical headed screw and a square shaft, on one end of " which is a nipper (holding the heel of the screw); this shaft " slides within a square box or casing." "The screw head (or " drill) is forced onwards with a rotary movement, and bores " into the rock." When pushed far enough, "the shafts are " turned in an opposite sense, and the screw retires to its " normal position, the whole being similar to a sliding " telescope."

The framing is modified for vertical drilling.

A particular drill is described. It is cased in sheet iron, " with a somewhat large head tapering to the heel (so that the " broken material having once entered into the casing shall " not lodge). This drill is to be made somewhat in the form " of a double auger."

[Printed, 4*d*. No Drawings.]

A.D. 1860, September 14.—N° 2228.

PAUTARD, Paul.—(*A communication from Benoit Rouquayrol.*)—Supplying air to persons in mines, &c.

A vessel filled with compressed air is fitted at the top with a chamber containing air at atmospheric pressure. A valve communicates between the vessel and the chamber, and is actuated by a species of flexible diaphragm, in order to maintain an even pressure of pure air in the atmospheric chamber. A flexible pipe leads from this chamber to an inhaling mask, which is likewise furnished with a flexible bag, duly valved, for the purpose of receiving the expired air to be mixed with a proportion of fresh air and reinspired, by which arrangement the supply of air is economised.

The apparatus may be modified in various ways, especially by the addition of a vessel of caustic possassa solution, through which the expired air is passed to free it from carbonic acid.

The apparatus is carried on the back of the user.

[Printed, 8*d*. Drawing.]

A.D. 1860, November 8.—N° 2751.

ROLLINSON, JOHN, and ROLLINSON, WILLIAM.—Working brakes for winding engines.

At the end of the drum shaft, or shaft carrying the brake wheel there is fixed a screw which works within a hollow slotted box. This screw is graduated according to the required number of revolutions of the winding drum, and during the period of these revolutions the screw revolves without putting in motion the slotted box. As soon, however, as the proper moment arrives the screw engages with the box and causes it to rotate with it. This rotation puts in similar motion a pulley which winds in a chain attached to the brake lever and puts on the brake.

[Printed, 8*d*. Drawing.]

A.D. 1860, November 24.—N° 2889.

FOWLER, JOHN, the younger; BURTON, ROBERT; and GREIG, DAVID.—Mine pulleys.

This invention relates to modifications in what is known as the "clip drum," described in the Specification of a Patent granted to the present inventors and another in 1859 (No. 216), being therein described as applied to hauling agricultural implements and cultivators.

These drums are now adapted to raising and lowering by mounting them vertically on horizontal axes. For mine purposes they are preferably mounted directly over the shaft. The drum is so constructed as to hold or nip the rope at the part where it passes over the drum. The rope lies between two knuckle-jointed levers, which yield to the pressure of the rope and nip it. The nipping parts can be adjusted to suit the varying sizes of rope. The drawing shows this drum fitted over a shaft in which the cages are caused to descend by loading them with water, the descending cage drawing up the full one.

There is also described a drum round which the rope takes several turns, the drum having screws mounted round its periphery. Each of these screws is rotated by a pinion, so that the revolution of the drum puts them all in motion. Thus moving, the screws traverse the coils along the drum, so that the rope may always pass on to and from the drum at the same point.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1860, November 30.—N° 2939.

PERRY, Edwin Creswell.—Safety winding.

The invention consists, firstly, in an arrangement for preventing the falling of the cage in case of a broken rope. The cage is hung inside an outer cage or framing, which ascends and descends between toothed racks. The rope is attached to the cage through the medium of a pair of crossed levers resembling a pair of scissors. The strain on the rope keeps the upper ends together, but should the rope break these ends separate under pressure of springs supplemented by the weight of the inner cage, and the lower ends then project horizontal bolts which engage with the racks and sustain the cage.

The invention consists, secondly, in the application of a self-acting dome cover for mine shafts. The winding chain passes through its summit. The dome is capable of being raised by the ascending cage in a wooden framing, wherein it is sustained by a catch. When the cage is about to descend it moves away the catch and allows the dome to settle down with the cage.

To ensure safety to the cage in case of overwinding, it is further fitted with a safety catch. Crossed levers are again employed, the lower ends holding the cage ring by means of a horizontal bar. Between these lower arms is placed a bar projecting some distance on each side. When the cage approaches the pulley, the catch passes through the ring, the bar being arrested, forces open the lower arms and frees the cage, which remains supported by the racks.

[Printed, 1*s*. Drawings.]

A.D. 1860, December 10.—N° 3028.

HUGHES, Richard Hugh. — "Improvements in means or " apparatus for supplying fresh air to mines and other " places."

The air may be collected in "apparatus similar to gas " holders of gas works, having a moveable upper part or " dome, and water or other suitable joints, with means adapted " to lift such upper part or dome to admit of air being collected " therein, whilst the weight thereof may be regulated to the " force required, and the air therefrom will be conducted by " a main or mains, and thence by branches readily attachable " to " channels, galleries, " tunnels or other workings, for the

" purpose of supplying fresh air thereto, or air adapted to
" neutralise any unpleasant gas." The air may be dried in its passage.

[Printed, 4*d*. Drawings.]

A.D. 1860, December 15.—N° 3082.

COLWELL, CHARLES.—(*Provisional protection not allowed.*) —"Preventing explosions in coal mines."

The object of the invention is stated to be "to neutralize the
" carburetted hydrogen and other gases tending to create such
" explosions by a certain and liberal supply of atmospheric
" air, to be continuously applied to all parts of the mines and
" other places affected, which has never yet been done; but
" the means of which, with other improvements," were intended to be described and fully detailed in the inventor's final specification.

[Printed, 4*d*. No Drawings.]

A.D. 1860, December 15.—N° 3087.

WILLIAMS, JOHN GRIFFITH.—Removing noxious gases from mines.

Main pipes are placed in the workings and are fitted with branch pipes rising to the upper parts of the workings to collect the light gases, and descending to the lowest parts when "heavier" gases are known to exist. The main pipes are led up the shaft to the open air and are fitted with a cap to form a gas seal against the admission of air. The branches in the mine are also similarly sealed. Artificial means, such as a furnace or an exhausting apparatus, may be used to facilitate the removal of the gases, or the system of main itself may constitute a gas syphon and act automatically.

[Printed, 10*d*. Drawing.]

A.D. 1860, December 27.—N° 3175.

DODMAN, GEORGE, and **BELLHOUSE**, WILLIAM.—"Im-
" provements in hoists."

This invention relates to apparatus "to be attached to hoists
" for the purpose of preventing accidents should the rope
" break or otherwise become slack. The hook to which the
" rope is attached is connected to levers, which at their other
" ends carry rods by means of which crank pins are caused to
" turn excentric rollers upon their axes. When the rope is

" distended these rollers are so turned as to be free from " guides placed between them. But when slack, the said " rollers are caused to bring their larger radii into operation " so as to press against the guides, and prevent the descent of " the hoist." A loop hangs down from the levers into the cage, so as to place this brake apparatus within reach of the person in the cage.

[Printed, 10*d*. Drawing.]

1861.

A.D. 1861, January 25.—N° 203.

LAW, Jesse.—Preventing accidents from overwinding.

The driving shaft of the winding engine is provided with a screw shaft, upon which travels a lever, one end of which hangs free, the screw passing through the other. As the screw shaft revolves this lever is traversed along it, and at the proper moment it comes against a set nut which brings it to a stop. This lifts it and causes it to strike simultaneously against catches or stops on the ends of horizontal levers, one of which puts on the brake and the other shuts off the steam, or reverses the engines, in which latter case the pendent lever traverses back to the other end of the screw shaft and repeats the operation there. During this time one cage has been drawn up and another let down.

[Printed, 6*d*. Drawing.]

A.D. 1861, February 1.—N° 265.

LEMIELLE, Théodore.—(*Complete Specification, but no Letters Patent.*)—Winding from mines.

The object of this invention is to provide a counterbalance for the winding rope in the shaft, and also to prevent the evil effects of winding coil upon coil. The rope is simply passed over a pulley at the top of the shaft, through the centre of the two cages and round a pulley at the bottom of the shaft. Short lengths of chain attach the cages to the rope. By this means a certain amount of play, so to speak, is allowed to the rope, to enable the cage at the top to be raised a little above its supports and then lowered upon them.

To prevent the cages rising above a certain point or to the pulley, "a stop made so as to slide on the moving pulley may " be fixed at the required point on the rope; the pulley will " then turn without drawing the rope with it."

The drawing shows the cage to work between guides and be fitted with safety catches to be liberated by the breaking of the rope.

[Printed, 10*d*. Drawing.]

A.D. 1861, February 4.—N° 288.

WALMSLEY, DAVID, and ROSTRON, JOHN.—Safety hoisting apparatus.

A toothed rack is placed in the shaft on each side of the cage, to act as guides or conductors. Above the cage is a cross shaft, free to rotate in bearings and so arranged that the whole weight of the cage does not depend from it, and thus retard or prevent its rotation. At each end of this shaft is a toothed pinion gearing with racks on horizontal bolts. So long as the cage is suspended, an arm by which the rope is attached to the cage, acts on the cross shaft and, through the pinions, holds back the bolts from the racks. But in case of breakage of the rope, the iron shaft is free to rotate and powerful springs impel the bolts into the racks. An arm is also arranged loosely on the cross shaft, but so as to be readily connected and disconnected by a suitable clutch and handle, for the purpose of withdrawing the bolts from the racks.

A diagram illustrates the mode in which catches may be substituted for the bolts, or the mode in which brake cams may take the place of catches.

The invention also relates to a disengaging hook for the prevention of overwinding. This consists of a "box disc " having pivots in its centre or axis upon which a link or " hook is jointed. In the edge of the box disc a T-shaped " slot is made, one end only of which will admit of the pas- " sage of the T-formed head of another link or hook, and thus " when it is placed in the T-shaped slots the box disc will " have to be turned on its axis before the T-headed link or " hook can be detached from the T-shaped groove." The disc is weighted so as not to turn by accident, and it has a projecting arm which comes against a stop when the cage ascends to this limit of safety. This arm turns the disc and allows the T-headed link to escape.

[Printed, 1*s*. Drawing.]

A.D. 1861, February 13.—N° 373.

POOLE, John; WRIGHT, James; HEMMING, Frederick Shand; and SEARBY, George.—"Improvements in drilling, "boring, or excavating rock or other earthy substances."

The patentees claim the following :—

Firstly, "The application and use of compressed air as a "motive power when applied by any machine to actuate drills "used for boring or perforating rocks or other earthy "matters."

Secondly, "The use of a cylindric hammer in combination "with a fixed piston actuated by means of compressed air, in "such a manner as to give successive blows, either directly or "through the medium of intervening levers, to a drill or borer "used in perforating rocks or other earthy matters, the said "drill being made to rotate either by hand or by mechanical "arrangements."

Thirdly, "The use of a moveable piston or hammer within a "fixed cylinder," acting in a similar manner.

[Printed, 6*d*. Drawing.]

A.D. 1861, February 15.—N° 388.

WESTHEAD, Marcus Brown.—Regulating speed in mine shafts, &c.

The patentee fits the cage with a governor, such as that employed for the purpose of bringing brakes into action to stop the cage, under the Patent granted to Hugh Baines in 1857 (No. 2821). The governor in this case is worked by a wheel running on the pit guide and when an excessive speed of descent is reached, it rings a bell, whereupon an occupant of the cage is warned to put on the brake provided for the purpose. This brake is put in motion by a hand wheel and acts by jamming itself against the pit guides.

[Printed, 6*d*. Drawing.]

A.D. 1861, February 21.—N° 438.

RIBTON, Herbert Panmure.—(*Provisional protection only.*)—Lighting mines.

An argand or other burner is enclosed in a glass cylinder, supplied with fresh air by means of a main laid in the working and fitted with a pipe for the escape of the products of combustion. The gas is brought to the cylinder also through a main and the supply is controlled in such a way that should the light go out the gas is turned off. The glass cylinder is surrounded by a wire cage, which, if struck by any object, moves a lever and shuts off the gas supply.

[Printed, 4*d.* No Drawings.]

A.D. 1861, March 13.—N° 613.

SPENCER, George.—(*Provisional protection only.*)—India rubber springs.

This spring is made of india-rubber, supported at intervals by plates of thin iron, wire gauze, or coiled wire, such plates being arranged so as not to project beyond the outside of the india-rubber, "by which means the india-rubber preserves a " more regular outline, and is less strained." When length of stroke is wanted, the ordinary projecting dividing plates may be used at intervals, in conjunction with the non-projecting plates.

These improvements are described as capable of useful application for "lifting springs and mine cradles."

[Printed, 4*d.* No Drawings.]

A.D. 1861, March 19.—N° 691.

CHALMERS, James.—"Improvements in constructing road-" ways under water."

This invention "consists in submerging tubes of suitable " dimensions and construction, in place of having recourse to " tunnelling as heretofore. It is preferred "that such tubular " roadway for deep water should be of a circular section, hav-" ing a rectangular inner way formed therein, as thereby the " pressure of the water at great depths may be divided between " the tubes by allowing the leakage of the outer or circular " tube to collect between it and the inner one until it obtains " such pressure as the inner or square tube may safely carry,

" then drawing it off through valves into the inner tube, thus " relieving by reaction the pressure on the outer or circular " tube."

In carrying out this invention a "tower" is first arranged at some intermediate point between the shores or banks between which communication is desired, the tower extending to the bottom of the water and to some distance above its surface. In this tower are suitable arrangements for pumping the water out of the lower part thereof. The sections of the tubular roadway are floated over the positions they are to occupy, and are partially filled with water, but not sufficiently to sink them, the actual sinking being determined by means of chains passing round blocks anchored under water, the weight of the water in the sections aiding such sinking. The sections next the tower are sunk first, and bolted to the tower, each section being furnished for the time being with bulkheads or partitions which prevent the entry of more water than is desirable. When one section has been bolted to the tower the partition next the tower is removed and the water pumped from that section, another section then being submerged and joined to the end of the first, and so on in succession. To aid in arranging the ends of the sections in their places there are openings in the partitions fitted with glass through which the workmen in a section already laid and pumped dry may see to adjust the end of the next section submerged. These proceedings are continued on both sides the tower until the shores or banks are reached. The tubes may be prevented from rising when emptied of water by placing stones in certain chambers connected with the tubes, or the whole tube may be covered by an embankment. When the depth of water is not great a single cylindrical tube may be used, furnished with a suitable floor and ceiling.

[Printed, 10*d.* Drawing.]

A.D. 1861, March 22.—N° 719.

VICTOR, Joseph, and POLGLASE, James.—Safety fuses.

The combustible material is enclosed in a small tube of lead or soft alloy, which tube is then drawn out between rollers, by means of which the combustible material is compressed and its slower combustion ensured. Lengths of this tube may be cut off as required.

[Printed, 4d. No Drawings.]

A.D. 1861, March 30.—N° 795.

RIDLEY, Robert, and ROTHERY, Joseph.—Machinery for hewing coal and other minerals.

"According to this invention it is proposed to hew or work " coal seams and other mineral strata by making a narrow " under cut in a horizontal or nearly horizontal direction, and " also one or more narrow vertical cuts on the face of the coal." A row of holes being then bored along the top, the block may be detached.

The machinery, which is capable of modification, consists of a framing mounted on wheels, and "provided at the top and " bottom with a horizontal transverse rocking shaft, and at the " two opposite sides with similar shafts placed in a vertical " position. Each of these several shafts carries one or more " vibrating arms keyed thereon, and these arms are each pro- " vided at their outer free ends with a suitable cutter for " acting upon the coal or other substance to be worked. A " vibratory or oscillating motion is imparted to these arms by " the aid of a crank and ratchet wheels, in combination with " helical springs on the shafts, the springs serving to give the " necessary blow or stroke for effecting the cut; whilst the " crank and ratchet wheels return the arms to their original " positions again in readiness for a fresh stroke. The crank " shaft may be driven either by hand or by any convenient " prime mover, and the entire machine is moved up to its " work by a self-acting or other travelling motion."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1861, April 3.—N° 821.

WRIGHT, Thomas, and WRIGHT, Hugh.—Steam brake for winding engines.

The brake blocks are put upon the wheel or drum by means of the strain exerted by the pressure of the steam upon the cylinder and piston. As the steam is admitted, the cylinder and piston move in opposite directions, and by this means the blocks on the opposite sides of the wheel are compressed, the piston acting on one set, the cylinder on the other. The valve is worked by means of a wire or cord, which passes to the mouth of the pit, and is there under the control of banksman.

[Printed, 8*d*. Drawing.]

A.D. 1861, May 22.—N° 1302.

DONISTHORPE, George Edmond.—Coal cutting machine.

This machine is intended to be used for the purpose of cutting horizontal or vertical grooves in the face of the coal. A carriage runs on rails in front of the work, and this carriage supports a pointed bar or tool which rests horizontally in grooved pulleys. As the carriage is advanced the workmen move the tools to and fro, so that at each blow each tool will cut a short distance into the coal, and thus a groove will be formed. When a vertical groove is to be cut, the grooved pulleys or rests for the tool are raised and lowered by screws.

[Printed, 6*d*. Drawing.]

A.D. 1861, June 3.—N° 1386.

PENRICE, Herbert Newton.—" Improvements in machinery " for tunnelling and driving galleries through rock and other " strata."

In the specification of the inventor's Patent, No. 2481 (1858), the machinery therein described is worked by steam supplied from a boiler at a distance. In the present invention the boiler is connected with the machinery, and the whole is mounted on wheels so that it may be made to progress as the work advances. Motion is given to the wheels by means of worms or screws acting on the axles. The working is ventilated by fans or by air pipes, and a system of scrapers is provided by which the chips or fragments of rock are removed.

[Printed, 1*s*. 10*d*. Drawings.]

A.D. 1861, June 3.—N° 1390.

DAVIDGE, Joseph Daniel.—(*Provisional protection only.*) —Blocks for lining tunnels.

"This invention consists in moulding or otherwise shaping " clay or other plastic materials, stone, iron, and wood, so " that in constructing the crown of a tunnel, for example, the " pieces shall be self-supporting, even without the use of " cement, if required." This is effected "by making two " sides of one of the pieces " "of a double wedge-shape pointed " at one end, and square at the opposite end." "The two " sides of another piece " are formed "of corresponding shape " to the sides of the aforesaid double wedge-shape piece, so

" that when two or more of such pieces are fitted one against
" the other, "the curved structure shall be self-supporting.

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 6.—N° 1419.

BAILEY, John, and BAILEY, William Henry. — *(Provisional protection only.)*—Indicating speed of mine cages.

The invention consists in "the application of governor balls
" to the ordinary colliery cage or winding indicators in con-
" junction with a steam whistle, bell, or other alarm, for the
" purpose of indicating when the cage attains a dangerous
" speed."

[Printed, 4*d*. No Drawings.]

A.D. 1861, June 6.—N° 1432.

JOHNSTON, William Oliver.—Pillars or supports for mines.

These pillars are made of iron, and are not intended to be abandoned in the workings, but to be removed. For this reason they are made in two parts, either scarf jointed and surrounded by a ring or ferrule to prevent separation of the parts, or hinged in the centre, or made the upper to slide telescopically within the other, but capable of being maintained extended by ratchet and pall or catch.

[Printed, 6*d*. Drawing.]

A.D. 1861, June 6.—N° 1435.

HEWETT, Edward.—*(Provisional protection only.)*—Ventilating mines.

"One or more screws, or sections of screws, or it may be
" blades set at an angle," are applied "in the upcast shaft,
" or in a channel in communication therewith." The screw is
rotated by any suitable power, and "its motion creates a cur-
" rent of air, which continues its straight course through the
" screw blades and channel in which they are placed. The
" screw blades may also be applied to force the air into the
" mine," "for the purposes of ventilation, instead of effecting
" it by exhaustion." "These blades do not diminish the area
" of the flue or channel, or necessitate any tortuous course
" for the air, or even a departure from the direct line of the
" channel."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July 13.—N° 1760.

RYDILL, GEORGE.—(*Provisional protection only.*)—" An " improved smoke consumer and condenser suitable for fac- " tories, railway engines, steam engines, steam ships, fur- " naces, brick kilns, cinder ovens, bakehouses, and other " purposes, namely, ventilation of factories, houses of parlia- " ment, places of public worship, public institutions dwell- " ing houses, streets, coal mines, railway tunnels, mineral " mines, iron works."

The invention is best described in the Patentee's own words :—

" As machinery to work a fan might at times become incon- " venient, the following method is found to give every satis- " faction :—I set the boiler inner flue with fire-bricks with a " chequered roof or plain invert; the ash place or box with " bricks with a tongue and groove, fitting into each other at " the bottom, top, and ends. I place in the flue any kind of " openwork of iron, copper, brickwork, or stone; the brick- " work fixed round the fire forms a retort, which gives a steady " heat to the boiler; the hot air is admitted from the boiler " house, factory, or any other place. The smoke from the " fire or fires passes into the flue or flues, where it is played " upon with water springers, hot or cold being used, which is " conveyed from the boiler or boilers by means of a pipe or " pipes; the water playing amongst the smoke as it travels " along towards the chimney causes a combustion and a con- " densation to take place which washes the carbon and sulphur " out of the heated body, which makes its way out of the flue, " leaving a white vapour to rise from the chimney. The draft " created by the pressure of water from the boiler or boilers, " and the combustion of the same in the flue, is so great that " no chimney is required to create a draft. Longitudinal " pipes fixed in the flue containing water answer the same " purpose as a tubular boiler."

The Patentee thus describes the application of his invention to tunnels, &c. :—" Coal mines, railway tunnels, and mineral " mines of every description can be ventilated by the means " of water springers in the same way, causing the water that " now exists in coal mines to become useful and valuable by " causing a draft to be obtained with safety in any portion of " the pit, and by having a supply of water at the top, or

" from any other elevated position, conducting the same down
" by means of a pipe or pipes."

[Printed, 4*d*. No Drawings.]

A.D. 1861, July, 19.—N° 1821.

SAVORY, WILLIAM and SAVORY, PAUL HAINES.—Winding apparatus for pits, quarries, &c.

The Patentees propose to place a drum round the horizontal boiler which supplies the steam to the engines. This drum has teeth to gear into pinions on the engine shaft, it runs or bears on friction rollers on the barrel of the boiler.

In order to guide the rope on to the drum, it is passed between pulleys attached to a frame, traversing along a screwed shaft in front of the drum. This screwed shaft is driven from the gearing of the drum.

[Printed, 10*d*. Drawing.]

A.D. 1861, August 9.—N° 1983.

HEMINGWAY, JAMES.—Apparatus for working coal, &c.

A number of holes are to be drilled in a straight line in order to facilitate the removal of a block of coal by wedging. For this purpose drills are carried in a frame, which is to be strutted against the work. The drills, which are square or polygonal in section pass through the axes of pulleys, by means of which they are rotated, the movement of rotation at the same time setting in motion a screw shaft which forces the back ends of the drills forward, and so keeps them up to their work.

[Printed, 8*d*. Drawing.]

A.D. 1861, August 31.—N° 2175.

COPPLE, JOHN, and COPPLE, EDWARD.—(*Provisional protection only.*)—Preventing accidents from overwinding.

The rope is attached to the cage through the medium of disengaging levers kept open by a spring. The disengaging is effected by the levers being drawn between two rigid bars, on which move friction rollers. A supporting apparatus is also provided, consisting of strong iron rods and bars suspended from the framing, and kept at equal distances apart by springs, the distance being less than the width of the lower part of the disengaging apparatus. This lower part when freed hangs on the supporting apparatus, but for greater safety a trap-door is placed about halfway up the framing, which trap-door opens by the upward passage of the cage and then falls, so as to shut off the shaft beneath the cage.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 23.—N° 2377.

JACOB, Joseph.—(*A communication from Carl Preisenhammer and Carl Weniger.*)—Blasting.

The inventor claims the use of hydrogen gas mixed with air or oxygen for the purpose of blasting. The mixture of gas and air is placed in holders of metal, india rubber, or other material, and ignited by a battery.

The chief improvements relate to the invention patented by the present inventor in 1861, (No. 593), which does not, however belong to the present series of Abridgments, consisting in various applications of hydrogen to the reduction of metals, and to its use as illuminating gas when carburetted, modes of manufacturing iron and steel by employing purified oxides, &c.

[Printed, 6*d*. No Drawings.]

A.D. 1861, September 24.—N° 2382.

DAVEY, Thomas.—Safety fuses.

This invention consists, firstly, in substituting or partially substituting wire for the fibrous strands of miners' fuses. These wires are twisted round a central core of powder, and the partially manufactured fuse is then passed through gutta percha, waterproof varnish, soft metal, or other suitable substance. Finally, it is passed between rollers, or otherwise submitted to pressure.

Part of the invention also applies to the manufacture of pipes by casting soft metal, or gutta percha, bitumen, earthenware, &c., round a spiral of wire, the resulting tube being then reduced by rolls or hydrostatic pressure.

[Printed, 4*d*. No Drawings.]

A.D. 1861, September 30.—N° 2433.

BICKFORD, John Solomon, and SMITH, George.—(*Provisional protection only.*)—Safety fuse.

This invention consists in applying an envelope of yarn, countered and varnished to metallic fuses. By this method, the necessity for a considerable thickness of metal is obviated, the fuse being sufficiently strong to bear the tamping process.

[Printed, 4*d*. No Drawings.]

A.D. 1861, October 16.—N° 2579.

LISTER, Joseph, and **MYERS**, David.—Safety cage and preventing overwinding.

Two guide rods extend from top to bottom of the shaft, and between them the cage travels. The latter is suspended from the rope by means of a system of levers and a safety disengaging clutch. Two of the levers embrace and slide on the guides; the remaining two are capable of having their ends jammed against the guides in the event of their other ends being freed from strain of the rope. To ensure their action springs are used. The rope is immediately attached to a piece which is grasped by a pair of levers. These levers are supplemented by a horizontal bar which, when it reaches the line of safety, comes into contact with a horizontal ring attached to the framing, and being there arrested forces open the levers, releases the rope, and compels the levers to sustain the cage by engaging with the ring.

[Printed, 8*d*. Drawing.]

A.D. 1861, October 25.—N° 2679.

LOBB, James.—(*Provisional protection only.*)—Composition or powder "for blasting."

Sawdust is substituted for charcoal and sulphur, and lime is added. "The object of the use of sawdust is to render the " smoke arising from the explosion " "in a confined place less " offensive, and to allow of the quantity of sulphur being re- " reduced; and the object of the addition of lime" is "to " counteract the deliquescent property of the nitrate of soda " or nitrate of potash employed in the manufacture of the " powder, and is more especially useful in the manufacture of " powder to be used underground or in damp situations."

[Printed, 4*d*. No Drawings.]

A.D. 1861, November 9.—N° 2811.

COWAN, David. — "Improvements in the construction of " pneumatic subaqueous tubes for passenger or goods traffic, " and in machinery for the manufacture thereof."

"This invention consists in constructing subaqueous tubes
" of solid or hollow staves, or of a combination of solid and
" hollow staves, of any size and length, and made of iron,
" wood, and other suitable material or combination of ma-
" terials. These staves are held together by a continuous
" iron band, wrapped spirally round the tube so formed, or,
" if preferred, by hoops of iron shrunk on. The staves, or a
" portion of the staves forming the tubes being hollow, or
" forming a hollow section, the tube can be regulated or
" weighted to the specific gravity of the water in which it
" is submerged, to remain at any desired level, by the ad-
" mission of water within the staves, and by substracting
" water the tube can be made to rise."

[Printed, 10*d*. Drawing.]

A.D. 1861, November 9.—N° 2813.

SIMPSON, George.—Boring apparatus.

The first part of this invention relates to the lifting and lowering of the boring rods. For this purpose a tall scaffold is erected over the bore hole and is provided with pulleys and counterweights. The latter are regulated according to the length of rods to be raised and are used accordingly, the rods being held by a self-acting clutch or gibble. In place of these means of lifting, an endless band or rope worked by a steam engine, may be employed, the lengths of rod being attached to the endless band or rope when they are to be raised or lowered.

In order to impart the reciprocatory motion to the boring rods they are worked by a steam cylinder valved like that of a steam hammer. In one method the cylinder is placed over the bore hole, a hollow piston rod, passing out through both cylinder covers, being used for the boring rods to pass through By another arrangement the cylinder is placed on one side of the hole and works one end of a beam or bar, the other end of which is hinged or supported on the opposite side of the hole. The boring tool is attached to the centre of the beam, and the latter may be swung out of the way when the rods have to be lifted out of the bore.

The invention also relates to a "sludge pump" and consists
" in substituting for the valve usually fitted at the bottom of
" the pump or barrel, an air valve fitted at or near the top
" of the barrel, whilst the bottom mouth is somewhat con-
" tracted" or is fitted with an "edged mouth piece" to fit

the bore. As the barrel descends, the air allows the air valve, to escape and the barrel to fill, but on drawing up the barrel the valve is closed and the sludge is retained.

[Printed, 10*d*. Drawing.]

A.D. 1861, November 15.—N° 2875.

NIXON, John.—Ventilating mines.

The apparatus consists "in the arrangement of rectilinear " ventilating pistons in such a way that they can work in " correspondingly formed air chambers in a horizontal manner. " These pistons are supported on rollers or wheels, which travel " on a railway, tramroad, or other metallic surface. The " pistons are attached to the motive power by piston and connecting rods in the usual mode. The air chambers can be " constructed of wood, iron or masonry, or of each or all of " them combined or conjointly. The pistons can be made air-tight by leather or other packing, or by being sufficiently " accurately fitted to the size of the air chamber as to render " such packing unnecessary. These air chambers are fitted " with intake and outstroke valves." Passages leading to the apparatus may be contrived to draw air from two pits at the same time if desired. The air when forced escapes into the atmosphere.

[Printed, 1*s*. 3*d*. Drawings.]

A.D. 1861, November 19.—N° 2902.

HEMINGWAY, James.—Coal cutting machine.

A revolving circular saw, or a revolving wheel or disc to which are attached saws or cutters, is caused to revolve horizontally by manual or other power, and so to cut a groove or recess in the face of the coal. The machine may be moved, while working, along a railway, by which means a long cut will be produced. It may be used vertically or obliquely. The inventor claims also a modification of this apparatus, consisting of a frame carrying straight saws or cutters, reciprocating in a straight line.

[Printed, 6*d*. Drawing.]

A.D. 1861, November 26.—N° 2975.

FIRTH, William, and RIDLEY, Robert. — Coal cutting machinery.

The machine is mounted on wheels suitable for moving on a rail or tramway. A cylinder and piston worked by compressed air actuates a hammer which, by repeated blows, drives a cutter into the face of the coal. As soon as the cutter has reached the limit of its travel it is withdrawn by means of a spring. The machine is also constructed to make upright grooves or cuts and in this case apparatus is provided for raising and lowering the cutting apparatus.

For breaking down the blocks of coal, instead of blasting, an expanding wedge is placed in the hole formed by the cutter, and is then caused to expand by turning a screw fitted with an inclined shoulder.

[Printed, 1s. Drawings.]

A.D. 1861, November 26.—N° 2977.

DONISTHORPE, George Edmund ; FIRTH, William ; and RIDLEY, Robert.—Coal cutting machinery.

Two machines are described under this invention. A carriage mounted on wheels runs along the face of the work, on a rail or tramway. It carries a cylinder fitted with a piston worked by compressed air. The cutter or pick is attached to a crank lever, the shorter arm of which is joined to the piston rod by means of a connecting rod. "The admission of air to the " cylinder is regulated by a slide valve, on the rod of which is " a spring, which tends constantly to force the valve to one " end of its stroke, viz., to that which will cause the piston to " return after having caused the pick to strike a blow. In " returning a roller on the head of the piston rod strikes a " lever, and by so doing moves the valve and so sets it as first, " to check the return of the piston, and then again to force it " outwards to cause the pick to strike another blow, and as the " piston rod moves outwards it will leave the lever, and the " valve is then carried back by its spring." Each time the carriage is moved forward, the pick is caused to make several blows in succession at the same place, till it has reached the required depth ; the pick is arranged to work up and down a short distance upon its axis as described in the specification of the Patent granted to Robert Ridley and Joseph Rothery in 1861, (No 795), in order to cause it to cut a groove wider than the picks' width.

This machine can be used to cut vertical as well as horizontal grooves, but for the former purpose it is preferred to use a machine having picks carried on horizontal axes, two cylinders and picks being used, one working upwards and one downwards.

Each cylinder is mounted on a vertical slide by means of a centre pin or axis, in order to provide for any irregularities in the road. The piston rods carrying the cutters are square in section in order that the stuffing box may prevent any turning on its axis of the piston rod and tool. The air is admitted through cylindrical valves worked by hand. It is preferred to compress the air at the mouth of the pit and lead it to the workings through iron and flexible pipes.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1861, November 27.—N° 2987.

BARCLAY, Andrew.—(*Provisional protection only.*)—Machinery for boring and winding.

A portable engine is employed. Two horizontal cylinders work a winding barrel, on the shaft of which is a spur wheel working another shaft and winding barrel, the former being used for winding the pump or clearer, the latter for lifting the boring rods. To work the boring rods a vertical cylinder is used, fitted with suitable valve arrangements, in such a manner that steam is only admitted on one side of the piston in order to raise the rods, the other side being open to the atmosphere. The descent of the rods is regulated by the escape of the steam from the cylinder. The cylinder may be placed over the bore hole, in which case the piston rod must be tubular to allow for the passage of the rods, or a beam may be used to which the rods are attached. A tripod is erected over the bore hole, carrying bracket pieces for suspending the boring rods in lengths. These rods are hauled up "by means of a clip or "catch, which is brought over the slot in the bracket, and "they remain suspended; the hook attached to the winding "chain slides down the rods in readiness to be attached to "another length."

[Printed, 4*d.* No Drawings.]

A.D. 1861, December 3.—N° 3025.

TREEBY, Thomas Wright Gardener.—"Improvements in "machines for boring holes in rocks and other hard sub"stances."

This apparatus is as follows:—The drill "is fastened to a "striking rod, which rod moves in iron or wood framing. On

" this striking rod there is fastened a serrated disc or face
" ratchet. On this striking rod is attached a spring that gives
" the blow to the boring tool. The boring tool is withdrawn
" by a cam or lug working on a spindle. The cam or lug on
" the spindle rotating strikes against the serrated disc or face
" ratchet. On the striking rod pressing the spring back, as
" soon as the cam or lug passes the centre the striking rod is
" instantly released, and the blow is given by means of the
" spring before named. The cam or lug on pressing the ser-
" rated disc back slightly turns it, so that the tool does not
" strike the rock in the same place. . . . When a jumping
" blow is not required the whole of the striking rods are held
" back, and a rotary motion given to the striking rods that
" hold the boring tool. On each striking rod there is a cog
" wheel, which is loose when a striking motion is required;
" but when a rotary motion is required the wheel is made fast
" to the rod."

[Printed, 1*s*. Drawings.]

A.D. 1861, December 3.—N° 3029.

BURROWS, James, and DOUGAN, Joseph. — Winding drums.

The first part of this invention relates to the application of a number of clips to the circumference of the drum, by which means an increased amount of adhesion is obtained. These clips are brought into action through the medium of rods and antifriction rollers which travel over a stationary cam on the shaft as the drum revolves.

The invention also relates to the construction of drums or pulleys, for round ropes used in mines, which drums or pulleys are made with their sides very near together and nearly parallel with each other, so that a space is left between them barely in excess of the diameter of the rope. Accordingly at each turn the rope is caused to wind on itself, coil upon coil. By this arrangement the leverage of the drum is increased as the rope is wound on.

[Printed, 10*d*. Drawing.]

A. D. 1861, December 31.—N° 3271.

NEWTON, William Edward. — (*A communication from Emanuel Lisbet.*)—" Apparatus for boring rocks and other
" mineral substances."

This invention relates to the frame for carrying the boring tool. It is made up of two pairs of parallel bars. One pair is provided with racks on its inner surfaces and with a claw at the bottom. The second pair works inside the first pair, and has a claw at the top, where the two limbs of the pair are connected. By means of screw gearing, worked either by toothed wheels or a lever the inner pair works inside the other, so that the frame is lengthened or shortened. Thus by the telescopic movement of the two frames the claws at their extremities are forced into the rock or other substance operated upon. The boring tool is supported by this framing, and motion is imparted to it by "a "winch handle, and the tool is made to advance into the "hole as the boring operation proceeds by means of screw "gearing."

[Printed. 10*d*. Drawing.]

1862.

A.D. 1862, February 1.—N° 274.

DEPREZ, Joseph.—(*Provisional protection only.*)—Raising minerals from mines.

The following is the inventor's Provisional Specification :—

Instead of placing the winding machinery at a distance from, with two pulleys placed above the shaft, "my machine will be "placed directly over the shaft, the spindles or drums will act "directly upon the barrels, and their alternate ascending and "descending motion be given by a special combination, which "consists in placing upon two separate axles, independent of "each other, and at suitable angles, the cranks and connecting "rods intended to produce the reverse movement of the "spindles or drums, and consequently the ascent and descent "of the cables. From the foregoing it will be evident that "the two axles being separated it is not only easy to reverse "the motion, but that they may be placed alongside of each "other, and thus occupy less space. Further, that as by "reason of this separation the cables perform similar and less "destructive work, they will last much longer."

[Printed, 4*d*. No Drawings.]

A.D. 1862, February 21.—N° 464.

CREASE, Edward Smith.—"Machinery for drilling, boring, "or excavating rock or other earthy substances."

The inventor, instead of striking the boring tool or drill with "a hammer," effects the operation "by means of a cylinder "and piston with a suitable hammer head attached to the "piston rod to strike the head of the boring tool or other instrument which is held in suitable guides, the boring tool to be "either connected with the hammer head, or it may be affixed "to it." This piston is worked by steam or other motion. The inventor also gives "a jumping rotatial motion to the drill or "other instrument by means of the hammer head if attached "to it, or if not connected to it, by means of tappets on the "hammer head communicating the necessary motion through "levers to a ratchet wheel on the head of the tool."

The cylinder, piston, and hammer head are steadily advanced by means of the valve rod, acting through levers and ratchet wheels on a screw, which, in its turn, works through a nut attached to the guides, in which the cylinder and hammer head are free to travel.

[Printed, 8*d*. Drawing.]

A.D. 1862, February 26.—N° 519.

REES, George.—(*Provisional protection only.*)—"Improvements in the construction of marine subways."

This invention "consists in the use of a floating caisson or "chamber having an opening above the surface of the water, "within which chamber the construction of the subway is "carried on. The subway is formed of a tube or series of "iron tubes flanged internally, cylindrical being preferred. "On one side of the chamber there is an opening corresponding to the size of the tube, and sliding thereon in a water-"tight manner. As the tube is lengthened the chamber is "pushed forward, and clay, stones, concrete, or other suitable "substances being brought into the chamber through the tube "are elevated, and deposited on the outside thereof so as to "form a support and protection for the subway as it is com-"pleted."

[Printed, 4*d*. No Drawings.]

A.D. 1862, March 7.—Nº 609.

FARRIMOND, Thomas.—(*Provisional protection only.*)—Safety cage.

"Two longitudinal shafts" are placed "through the cage "near the centre and on each end of the shafts eccentric "levers having teeth at their extremities" are fixed. "The "said shafts are worked by a coupling and chain connected "with the main rope, and one or more springs are attached "to the coupling for the purpose of turning the shafts and "bring the toothed ends of the levers forcibly in contact with "the guide rods or ropes whenever the main rope breaks, and "thereby hold the cage and prevent accident."

[Printed, 4*d.* No Drawings.]

A.D. 1862, March 8.—Nº 633.

GISBORNE, Frederic Newton, and **WICKENS**, Henry.—(*Provisional protection only.*)—Indicating obnoxious gases in mines.

A delicately poised lever is placed in a globe or vessel of glass, which vessel is then closed by two thicknesses of india rubber strained on a ring, about half an inch apart. The lower thickness carries a metallic stud. An electric wire is placed over the stud between the diaphragms and another wire near the other end of the lever. If carburetted hydrogen be present, the expansion of the air in the vessel will force the inner diaphragm outwards and so bring the stud against the wire to complete contact. If carbonic acid be present, the diaphragm is forced inwards and coming in contact with levers brings its other end in contact with the other wire, with the same result. The current of electricity may then be caused to give a signal, either audible, as by ringing a bell, or visible, as by showing a signal light, or may be made to explode the gas. An aneroid barometer may be modified to produce similar results.

[Printed, 4*d.* No Drawings.]

A.D. 1862, March 10.—Nº 648.

CARLOW, John Thomas.—Safety cage and disconnecting apparatus.

The safety apparatus is not connected with the winding rope. Grippers are fitted to the cage, which at the proper moment come into action and sustain it by engaging with guides. Springs are fitted to the grippers, creating in them a constant tendency to come into play. This tendency is nominally neutralised by weights, but this effect is overcome on the breakage of the rope and sudden descent of the cage.

To prevent overwinding a detaching hook is used. "This " hook consists of two bars or legs jointed together at one " end, and hooked outwards at the other; these bars or legs " are connected to the chain or rope by means of a shackle at " the joint. The hooked ends carry a curved slotted pleat, " which are distended by the weight of the cage or twist by " bearing down the joint of a pair of shorter bars or legs " jointed together and placed between the longer or outer bars " or legs, which said shorter bars or legs have a shoulder " bearing also upon the curved slotted plate between the bars " or legs" the patentee inserts "one or more plate springs to " keep the hook in position, when the weight of the cage or " hoist is not bearing upon it. Under the pulley" is fixed "a " ring of such diameter, that the hook cannot pass through, " unless the bars or legs are closed, so as to release the hooked " ends from the curved slotted plate, thereby detaching the " rope or chain from the cage."

[Printed, 8*d*. Drawing.]

A.D. 1862, March 25.—N° 824.

GUIBAL, THEOPHILE.—Ventilating mines.

The ventilator consists of a rotatory fan which is placed within a cylindrical case of brickwork, "the axis of the fan being " somewhat excentric to the centre of the case." The foul air is conducted from the mine into one side of the case, through a suitably constructed passage. An outlet chimney communicates with the periphery of the case and it increases in diameter as it ascends. "In order to regulate the dimensions " of the outlet from the cylindrical case into the chimney a " regulator or slide is used at the outlet, taking the curve of " the cylindrical case," and for this purpose being made of thin planks or slats of wood joined by flexible iron bands.

The regulator is adjusted by a chain or wire cord passing over pulleys at the upper part of the chimney.

[Printed, 1*s.* 8*d.* Drawings.]

A.D. 1862, April 2.—N° 922.

HARRISON, William Currie, and STANDLY, Henry John.—"An improved instrument or tool for boring or drilling holes "in slate or other rock."

This invention consists in the application of water to the drill while at work. The water may be applied in a continuous stream to the point of the drill, the spiral form of which aids in carrying the borings back; or the cutter may be secured to a tubular stem, through which water is conveyed to the cutter by a central tube. Or the central tube may alone be sufficiently strong to carry the tool. The outside of it is spiral, or otherwise shaped, in order to agitate the mixture of water and borings.

[Printed, 8*d.* Drawing.]

A.D. 1862, April 14.—N° 1069.

HAMPSHIRE, Joseph Kaye.—Safety cage and preventing overwinding.

The winding rope is attached to the cage through the medium of a disconnecting hook or catch. This consists of two bars, their top ends being slightly divergent, holding between them in a recess, the ring on the winding rope. When the cage is in danger of being overwound, the divergent ends of the bars come against fixed stops, which cause the bars to open or separate, and so to release the ring and the rope.

The catch is connected with the cage by iron bars and levers. When the cage is properly suspended, the levers are held clear of the guides, but should the rope break or become disconnected, then springs draw the levers to the guides and the weight of the cage jams them together and so prevents the cage from falling.

[Printed, 1*s.* Drawings.]

A.D. 1862, April 15.—N° 1084.

NEWTON, Alfred Vincent. —(*A communication from F[illegible]deric Wynants and Prosper Esselens.*)—Blasting powder.

According to this invention nitrate of baryta is substituted for the greater part of the saltpetre. The following proportions are said to produce good results :—Nitrate of baryta, 77 parts ; charcoal, 21 parts ; and saltpetre 2 parts. No sulphur is used. Nitrate of lead or nitrate of strontia may also be used in the place of the baryta salt. To increase the inflammability of the powder, the grains may be dusted or coated with ordinary powder in a fine state.

[Printed, 4*d*. No Drawings.]

A.D. 1862, April 28.—N° 1240.

GOODMAN, George Barry.—(*Provisional protection only.*) —Safety cage.

Racks or toothed guides are placed in the shaft and corresponding catches are fitted to the cage. These catches are kept withdrawn from the racks by means of chains linked to the winding rope, but when not so held back are projected into the teeth of the racks by springs. Other springs are fitted for the purpose of interposing wedges behind the projected catches, to prevent their being jerked back from the racks.

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 5.—N° 1334.

VICTOR, Joseph, **POLGLASE**, James, and **ROUNSEVELL**, William.—Safety fuses.

The invention consists, firstly, in protecting fuses made of tubes of lead, by winding round them strips of thin zinc or other hard metal in a simple state or combined ; secondly, in making fuses from skelps of metal formed into troughs or grooves, filled with powder and closed by rolls. The edges overlap and so strengthen the tube. Such fuses may also be tinned or galvanized or electro-plated. The longitudinal joint may also be made by soldering, or the tube may be spirally covered as above.

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 10.—N° 1404.

MOORE, Robert.—Indicating the presence of gases, &c. in mines.

For indicating the presence of water, a box containing a float is used, the latter by its rise and fall communicating indications. In another arrangement for the same purpose, " barometric pressure " is used " for acting on the metallic or " other means of contact to complete the action of the trans- " mitting medium." Again, the " transmitting medium " may act " on the agent of indication ;" for instance, a liquid may complete an electric circuit.

For indicating light gases, a float may also be used, but in this case it will be " depressed with the action of the atmo- " sphere." An apparatus resembling a Davy lamp having inside it incandescent electrodes, may also be used. When explosive gas is present, its ignition inside the apparatus is caused to effect the indication by signal.

For heavy gas or carbonic acid, the float apparatus may also be adapted.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 12.—N° 1419.

POPE, John Buckingham.—" Lowering and loading coals, " minerals," &c.

" For this purpose the waggon or carriage containing the " coals or other material is carried on rails from the mouth of " the pit, or other situation on to the tipper which is connected " to a moveable stage suspended from a pivot, the front of " which stage may be lowered gradually, by means of an " ordinary spring brake, at the same time that the tipper is " tipped or upset on the release of its brake, the front of the " stage being raised to its original position (after the waggon " or carriage has discharged its contents) by means of coun- " terbalance weights. ' The usual screen, which is vertical, has " arms mounted on fixed centres in the framework of the " moveable stage, and is moveable on its centres, so as to " become inclined when pressed forwards, by means of a pro- " jection on the front of the waggon or carriage, or by the " pressure of the waggon when upsetting, but is restored to " its vertical position (on the removal of such pressure) by " means of a counterbalance weight." " A horizontal screen " is fitted " in the floor of the swinging stage, a lid " being " connected to the ' tipper.' " The minerals are retained within the waggon till they are "sufficiently near the screen "to admit of discharge with comparatively little breakage." "This object is also accomplished by means of the lid "working on centres at one end of the tipper, and free at "the other end, such lid being retained in its position "during the inversion of the tipper, until two catches (which "may be fixed on the side of the tipper) strike against the "framework of the swinging stage," or other projection.

[Printed, 10*d*. Drawing.]

A.D. 1862, May 13.—N° 1433.

JOHNSON, JOHN HENRY.—(*A communication from François Durand.*)—(*Provisional protection only.*)—"Flexible tube "or casing for constructing submerged works."

"In applying this invention to the constructing of a tunnel "under water, . . a trench is first formed in any well-known "manner along the bottom, and into this trench is sunk in a "collapsed state a tube of any strong and waterproof material "such tube being of a length sufficient to extend from shore "to shore, and of a diameter large enough to contain the "tunnel when built. At one or both ends of this tube are "introduced or erected suitable skeleton frames of iron or "other material, which will keep open or distended the "hitherto flattened tube, and bring it to the form of the "transverse outline of the tunnel." The tunnel is built in this tube, and "as fast as the work proceeds the skeleton frame "is continued further."

[Printed, 4*d*. No Drawings.]

A.D. 1862, May 19.—N° 1516.

MORRIS, TIMOTHY, WEARE, ROBERT, and MONCKTON, EDWARD HENRY CRADOCK.—Lighting mines.

This invention relates, among other things, to producing light for mines, by passing currents of electricity between terminal points in partially exhausted glass tubes or other vessels. The tubes may contain other gases or vapours than air in an attenuated state. The electricity is preferably obtained from the induction coils patented by the inventors in A.D. 1861, (No. 2661), but the Specification of this Patent does not come within the scope of this series.

[Printed, 4*d*. No Drawings.]

A.D. 1862, June 5.—N° 1692.

RYDILL, George.—Ventilating mines.

This invention chiefly relates to pumping apparatus, but it also relates to a means of ventilating mines. For this purpose the inventor places "as many water pressure engines, turbines, " or rotary motion engines down in the mine as may be re- " quisite." He then conveys "down from the top of the " mine a pipe or pipes, or from a cistern collecting the water " which may accumulate from any part of the mine capable " of supplying with effect a water pressure engine, turbine, " or rotary motion engine, through the pipes carried down to " supply them with water. After the water has expended its " power from the hydraulic pipes" it is taken in pipes to "a " water conductor to convey it to the well or sump to be " pumped up again. To each engine" the inventor attaches a fan or fans, forcing and drawing air, enabling "any part of the " mine to be properly ventilated."

The advantage claimed for this system is, that by the use of the inventor's pumping machinery the water can be so easily removed from any depth.

[Printed, 2*s*. 6*d*. Drawings.]

A.D. 1862, June 17.—N° 1786.

CRESTADORO, Andrea.—Ventilating mines.

After describing methods of obtaining motive power from a current of air produced by a furnace, the patentee explains a method of ventilating mines. He places a furnace in the open air outside the pit, and supplies this furnace with air drawn from the workings of the mine by means of a pipe. The furnace is so arranged that all the air required for its use is thus derived. A full reservoir is placed on each of two sides of the grate, the other two vertical sides being gridded, to allow for the passage of the draught. Apparatus is fitted to the fuel reservoirs for supplying regulated amounts of fuel to the fire.

[Printed, 6*d*. No Drawings.]

A.D. 1862, June 17.—N° 1796.

KELLOW, Joseph, and SHORT, Henry.—Blasting powder.

This powder is composed of nitrate of potash, chlorate of potash, and nitrate of soda (crude nitrate of soda being preferred, and the two nitrates being used in a state of solution), combined with sawdust, tan, and sulphur. Sometimes the nitrate of potash or chlorate of potash is dispensed with, and sometimes either sawdust or tan may be used instead of both sawdust and tan. Four different methods of manufacture are given with the view to produce powders of different action. These processes differ chiefly in the treatment of the chlorate of potash.

[Printed, *4d.* No Drawings.]

A.D. 1862, June 18.—N° 1800.

COLTMAN, FRANCIS.—(*Provisional protection only.*)—Discharging coal and other minerals.

The object of this invention is to diminish breakage, and it is effected by discharging the coal "towards the higher part of "the shoot or inclined plane" "instead of towards the lower "part thereof." "The waggon is enclosed by the sides and "lid of the tippler, the lid being made to turn on centres "fixed at the end of the tippler farthest away from the pit, or "towards the lower part of the shoot or inclined plane, and "having a loose flap in front, which prevents the coals or "other substances from falling out of the waggon before the "required time. The waggon being run into the tippler is "secured therein by means of a key turned by a handle, and "there is the usual brake. The supports of the waggon are "withdrawn by turning a handle, on which the tippler is "caused to descend until a pin in the flap of the lid passed "through a slot in the side frame of the tippler is brought in "contact with a projection fixed on the shoot," "by which the "lid is caused to open and allow the coals" "to fall out of "the waggon on to the shoot" in a direction towards the "upper part thereof. The tippler is restored to its original "position by means of a counterbalance weight." The shoot may or may not be fitted with a screen.

[Printed, *4d.* No Drawings.]

A.D. 1862, June 21.—N° 1831.

SIMPSON, GEORGE.—Boring and mining machinery.

This invention relates to improvements upon the invention for which the present patentee obtained Letter Patent in 1861

(No. 2813). According to that invention the boring tool is attached to the piston rod worked by a steam cylinder, the bottom of which is always open to the boiler to provide a cushion to moderate the blow.

"By the present invention the piston is provided with a "trunk or enlarged piston rod on its under side, in order" to reduce the area of steam pressure, whereby a preponderance of effective pressure is obtained on the top side. A number of chisels are fitted to the holder, projecting like steps, "so that "a transverse movement being made between each stroke, "each chisel strikes in a place previously struck by its shorter "neighbour, and the cut is then gradually driven in to the "depth of the longest chisel." The blow is struck by the pressure of the steam on the larger side of the piston, the constant pressure on the smaller side returning the piston for a fresh stroke. Thus the valve arrangement is simplified. The machine is held or moved in various ways, and grooves may be cut, after which the block may be wedged down.

In another system the cylinder is made to work a single chisel, which is fitted so that it can be turned at each stroke. With such a tool a row of holes is bored, the spaces between being afterwards broken out.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1862, July 2.—N° 1928.

JOHNSON, BRYAN.—(*Provisional protection only.*)—"Rope "wheels for mines."

"The object of this invention is to afford the means of a "ready adjustment of the length of the winding rope between "the rope wheel and the cage." Accordingly the rope wheel is made detached from its boss, and able to rotate thereon. Holes are drilled at intervals through the flanges of the boss and the wheel, there being more in the latter, for the reception of bolts to secure the wheel and boss together. So, by turning the wheel round and placing the bolts in other holes, a means of adjustment is obtained. There are various ways of obtaining the separate movement of wheel and boss, and in another arrangement a ratchet wheel and catches are employed, either on the wheel or on the boss.

[Printed, 4*d.* No Drawings.]

A.D. 1862, July 14.—N° 2027.

RIDLEY, Robert, and JONES, James Grafton.—Ventilating mines.

Two forms of apparatus for this purpose are described. In one the top of the shaft is fitted with a horizontally revolving drum, the sides of which consist of four curved plates, leaving as many openings in planes radiating from the centre of the drum. The foul air is drawn up the shaft, through the centre of the drum from the lower side, and discharged at the periphery.

In the other form the drum is mounted vertically on a horizontal axis, the shaft being closed. The foul air is led by passages to the axis of the drum and discharged at the periphery.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1862, July 16.—N° 2036.

JOHNSON, Bryan, and TAYLOR, Edward Henry.—(*Provisional protection only.*)—Rope wheels for mines, cage springs, &c.

" The object of this invention is to afford the means of a " ready adjustment of the length of the winding rope or chain " between the rope wheel and the cage." For this purpose the wheel is mounted loosely on its boss, so that it can be turned thereon. In the flanges of the boss are drilled holes, and in the wheel similar holes are drilled only in a greater number, " so that the bolts employed for holding the wheel " and boss together can be passed into different holes, and " thereby obtain a very delicate adjustment of the length of " rope." A similar result may be obtained by the use of ratchets and catches, instead of holes and bolts.

The Provisional Specification also mentions " an arrangement of india-rubber or other springs and wrought-iron " straps " to connect the cage and rope, but this arrangement is not described.

[Printed, 4*d.* No Drawings.]

A.D. 1862, July 21.—N° 2071.

GEDGE, William Edward.—(*A communication from Antoine Trouillet.*)—Boring tools.

These tools are intended to form an enlarged cavity in a bore hole. Many varieties of them are illustrated and described, their principle being that a cutter is fitted at the end of a tube capable of being passed into the bore, which cutter is forced into action or withdrawn by means of its angular movement produced by the depression or elevation of a bar passing axially through the tube.

A contrivance is also described for inserting wood tamping pieces into enlarged cavities, but the "apparatus does not form " an essential part of this invention."

[Printed, 1*s*. Drawings.]

A.D. 1862, August 1.—N° 2185.

PLEVINS, Charles Henry, and RIDER, Henry.—Discharging coal from waggons, &c.

The front of the waggon is fitted with a door, suspended by hinges from the top. It is secured at bottom by bent pieces of metal, from which it is freed by slightly raising it edgeways. For this reason the door is hung on levers, which, at the proper moment, come in contact with fixed stops near the shoot and so opens the door to allow the coal to be discharged. The waggon runs into a pivotted counterbalanced platform and is prevented from running further by the ends of the rails being turned up. The platform then tips and the door being opened the coal is emptied into the shoot, then only a few inches from the door of the waggon. A brake is fitted to the pivot of the platform.

[Printed, 10*d*. Drawing.]

A.D. 1862, September 3.—N° 2441.

BROOMAN, Richard Archibald.—(*A communication from Jean Rodolphe Leschot.*)—Boring machinery.

A diamond cutter is contrived by setting these stones in a ring of iron or steel. The ring is carried by a tube connected with a shaft by a bayonet joint. A flexible pipe supplies water for removing the debris. "The apparatus for working " the tool is mounted upon a carriage on wheels, or on a bed " supporting standards in which bearings are formed for receiving the shaft to which the tool is fitted. Rotary motion " is imparted to the shaft through a toothed wheel gearing into " a pinion on the driving shaft, which has motion communi-

" cated to it from a crank pulley or otherwise. The advancing
" motion is communicated through a wheel on the crank shaft
" communicating motion to another wheel on the tool shaft,
" through the agency of an intermediate wheel; one end of
" the tool shaft is threaded, so that while it revolves the screw
" at the same time imparts a forward motion to it."

[Printed, 8*d*. Drawing.]

A.D. 1862, September 11.—N° 2505.

BARCLAY, Andrew.—(*Provisional protection only.*)—" Locomotive boring and winding engines."

On a horizontal tubular boiler a pair of standards are fitted. They carry the beam, one end of which is worked by a pair of vertical cylinders placed on the upper part of the boiler at one end. The other end overhangs the end of the engine and carries the boring rods. On either side of the boiler is a horizontal cylinder, and these cylinders drive a crank shaft extending across the boiler. A pinion on this shaft drives the winding barrel, which is contrived so as to be thrown in and out of gear as required. By bringing other gearing into play the engine may be worked from the crank shaft as a traction engine. The details of this engine may be variously arranged.

By one modification a vertical boiler is used, the funnel serving as the beam standard.

[Printed, 4*d*. No Drawings.]

A.D. 1862, September 29.—N° 2640.

LORD, William Barry, and GILBART, Frederic Hughes.—Loading blasting cavities.

The Specification describes an apparatus intended to be temporarily attached to the end of a ramrod for loading rifles, &c. It consists of a cylinder to hold the charge, fitted with a mushroom valve at the bottom having depending from it a bar or rod. As the apparatus is lowered, the bar comes into contact with the breech, opens the valve, and allows the charge of powder to be deposited in its place.

The invention is claimed to be "also used for depositing
" the blast charge of powder in mines, for which purpose
" the construction of the apparatus is sometimes slightly
" modified."

[Printed, 6*d*. Drawing.]

A.D. 1862, October 2.—Nº 2662.

GILCHRIST, JAMES. — (*Provisional protection only.*)— " Boring engines."

The "principal parts are fitted upon a framing, which is " by preference mounted upon wheels. The parts comprise a " steam boiler, winding details with actuating cylinder or " cylinders, and a cylinder for imparting the required reci- " procating motion to the boring rods; this last mentioned " cylinder, which may be fixed or oscillating, is disposed hori- " zontally, and its piston rod actuates the vertical arm of a " bell crank lever," to the other arm of which the rods are attached. The steam may act on both sides or not of the piston. "When the boring rods have to be drawn out of the " bore, the bell-crank lever may be disconnected and turned " out of the way."

[Printed, 4*d*. No Drawings.]

A.D. 1862, October 31.—Nº 2952.

JENKINS, WILLIAM.—Cutting coal.

Two machines are used for this purpose, a boring machine and a sawing machine. The machinery is capable of being used for mining on both the "long wall" and "pillar and " stall" systems, and in the Specification the inventor describes their use under the former system. An endless wire rope passes through the workings, supported on pulleys and passed round turning pulleys at angles. This rope is driven from a drum, and actuates the machines. The drilling machine is first brought into play. The holes are made by a drill, the shaft of which works through the axis of the actuating pinion. These holes form the starting points of the sawing machine. The saw is perfectly straight, the teeth inclining upwards and towards the machine, so that it withdraws the debris at each stroke. It is mounted in a reciprocating slide, and may be used to cut vertically or horizontally. A circular saw may be used if preferred. The machines are worked by the rope, which is lifted into contact with a friction pulley, by means of a lever having at its end a smaller friction pulley.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1862, November 26.—Nº 3173.

AUSTIN, WILLIAM.—(*Provisional protection only.*)—Blasting cartridge cases.

This invention relates partly to the preparation of waterproof cartridge cases for blasting purposes. The material for this purpose consists of a sheet of some woven fabric, coated with a suitable adhesive solution, after which it is covered with a layer of paper on one or both sides, pressed and waterproofed. Paper pulp may be used instead of paper, waterproofed or otherwise.

[Printed, 4*d*. No Drawings.]

A.D. 1862, November 28.—N° 3189.

JOHNSON, John Henry.—(*A communication from Edmond Langlois.*)—Indicating the presence of minerals.

Various forms of apparatus for this purpose, and for detecting the presence of bullets in wounds, &c., are illustrated. They are all constructed on the principle of causing the mineral or other substance to complete an electric circuit, and so to afford indications, for instance, by ringing a bell. The apparatus may be in the form of a staff made up of two concentric tubes attached to the poles of a battery, or of branches of wires, or of flat surfaces inlaid with wires in a serpentine pattern, &c.

[Printed, 8*d*. Drawing.]

A.D. 1862, December 8.—N° 3288.

SANDERSON, Charles.—Bands for mines, &c.

Bands are made of sheet steel well polished. They are then electro-plated with brass. India-rubber is next placed on the brassed surface and "vulcanized thereon," so as to cause it to adhere closely to the metal. For mining purposes several of these bands, with interposed india-rubber, are used. The various lengths of steel are joined by rivetting or otherwise, so as to break joint.

[Printed, 6*d*. Drawing.]

A.D. 1862, December 9.—N° 3297.

BENTON, Marshall Franklin.—(*A communication from Samuel Ricker.*)—(*Provisional protection only.*)—Gunpowder for "blasting" and other purposes.

This gunpowder may be of the following composition:—Water, 38 parts by weight; charcoal, 2 parts, boiled together, to which are added chlorate of potash, 20 parts, of a mixture of 4 parts of "half calcined sea grass and two parts of finely " pulverised stone coal," 6 parts. All these are boiled together, and 7 parts of sawdust added.

"Instead of the mixture of sea grass and stone coal, the fol-" lowing mixtures may be used if preferred," viz. :—Nitrate of soda, 5 parts, and pulverised stone coal, 1 part, or nitrate of lead, 5 parts, or saltpetre, 5 parts, both being mixed with 1 part of the coal; or 2½ parts of saltpetre may be used instead of 5 parts.

Another powder consists of water, 20 parts; charcoal, 1 part; chlorate of potash, 10 parts; half calcined sea grass, 5 parts; pulverised stone coal, ¾ part; and sawdust, 4 parts; all boiled together. The five parts of sea grass may be replaced by five parts of carbonate of soda, or 4 parts of nitrate of lead, or 4 parts of saltpetre; and the 4 parts of sawdust may be replaced by 4 parts of dried coffee grounds or 3½ parts of parched wheat.

Another kind is made of wheat flour, 2 parts; chlorate of potash, 10 parts; stone coal, 1 part; charcoal, 1 part; and 3 parts of water.

The last kind is made of 2½ parts of flour, 10 of chlorate of potash, 7½ parts double carbonate of soda, 4 parts of nitrate of lead, 1½ of stone coal, and 1 of charcoal, with 3 parts of water.

[Printed, 4*d*. No Drawings.]

A.D. 1862, December 11.—N° 3322.

CLARK, Robert.—Boring and winding machinery.

The machinery is carried on a low framing. Two horizontal steam cylinders actuate a first motion shaft carrying a spur pinion, which gears with a toothed wheel on a second motion shaft. The first motion shaft also carries "a lever, arm, or " cam piece, arranged to work upon a catch or projecting stud " piece upon a vertical connecting rod which is connected to " one end of the main boring lever. This main lever is set " upon a fixed overhead centre carried by the framing, and to " the other end of it is jointed or suspended the boring bar, " which then receives an up-and-down boring motion. The " pedestal or journal carrying this lever is adjustable laterally, " so that the parts can be set clear away from the line of bore

" whenever access is required for cleaning or other purposes.' The vertical connecting rod is capable of being fitted with counterbalance weights. "To the lower end of this connect-" ing rod there is also jointed a horizontal connecting rod, " the opposite end of which is jointed or linked to a crank or " lever arm set on a horizontal shaft carried by the framing, " and which shaft also carries another short lever with a nut " for being worked by a screw spindle. By turning the " screw spindle the connecting rod can be set in or out from " the path of the operating cam or lever upon the first motion " shaft, and thus the stroke of the boring apparatus can be " regulated." The second motion shaft carries winding barrels, fitted with frictional clutches.

[Printed, 1*s.* 4*d.* Drawings.]

1863.

A.D. 1863, January 3.—N° 30.

NEWTON, William Edward.—(*A communication from George Washington Beardslee and Frederick Edwards Beardslee.*)—Fuse for blasting charges.

This is an electric fuse, the connection of the two conducting wires being effected by the interposition of a "feeble or film-" like conductor, whether such interposed feeble conductor be " placed directly in contact with the powder, or with a com-" bustible substance interposed." The conducting wires are mounted in a block of wood, and a line is drawn between them with a soft and good plumbago pencil. This pencil streak forms the igniting link in the conductor.

[Printed, 6*d.* Drawing.]

A.D. 1863, January 9.—N° 71.

PUNSHON, John.—(*Provisional protection only.*)—"Pre-" venting overwinding."

The winding engine is fitted with a "counter cylinder" having "a "piston travelling the same way as the working " piston, with steam put on the counter side of counter piston " to balance the engine." This cylinder has "two steam ports

" and no exhaust port, and is so arranged that the steam
" works out of the boiler on to the counter piston, the counter
" piston forcing it back into the boiler, and so continually
" working from boiler to cylinder, and cylinder to boiler."

"When the weight or cage gets past the midway of the pit
" its application to stationary winding engines will be that
" the steam in the counter cylinder will balance the additional
" weight of the descending rope, and the loss of weight in
" the ascending rope, thereby causing the engine to run the
" whole journey with a uniform motion, and at the end of the
" journey to offer such resistance by pressure in the counter
" cylinder that overwinding will be prevented. And by further
" arrangement the counter cylinder can be made to assist the
" working cylinder to the midway of the pit, and so double
" the power of the engine."

[Printed, 8*d.* Drawing.]

A.D. 1863, January 13.—N° 113.

ROCK, John Boyle.—Fire-escape for mines.

This invention relates to an improved fire-escape, which is also described as modified for mine shafts. A tube is built up the shaft, sufficiently strongly to ensure its preservation even should the shaft be stopped by falling materials. In this tube there is placed an endless chain carrying platforms at intervals, upon which men could be raised to the surface.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, February 27.—N° 557.

DUDGEON, Arthur, MEAKIN, George Frederick Lee, and ALLEN, Edward Ellis.—"Improvements in the con-
" struction of underground railways or subways."

The invention may be described generally as a method of
" constructing the sides and roofing of subways or underground
" railways by the removal, in the first instance, of such an
" amount of earth only as shall be sufficient to lay, embed, or
" sink such sides and roofing separately, or at the same time
" replacing the said earth and making the roadway good over
" the subway, leaving the earth between the said sides and
" under the said roofing, to be subsequently excavated and
" removed in any convenient manner through open cuttings or

" shafts at places where no greater amount of traffic exists. " . . . After the excavation or removal of the earth in the " tunnel or subway shall have been effected, the bottom may " be formed and made good, and the subway consequently " finished in considerably less time than would be possible " were the whole of the earthwork removed down to the base " or floor of the subway at one and the same time.

[Printed, 1*s*. Drawings.]

A.D. 1863, February 27.—N° 560.

DELAHAYE, Victor Désiré.—" Improvements in apparatus " for clearing and excavating pit coal, and rock or earth."

The apparatus consists of two standards secured at the top and bottom or ends against the rock or the partition walls of a mine or other cavity. These standards "form guides for slides " worked by means of a lever and a ratchet and a pulley with " a cord round it, such slides having connected to them, by " means of a suitable cross framing, the carriage for the " travelling tool, which carriage has holes in it for the insertion of a forked bar or bars, by means of which the carriage " may be worked as required along the cross framing, friction " rollers being applied to the carriage in order to facilitate its " motion thereon. By means of the foregoing arrangement of " apparatus the operations of the workmen will be made to " consist in guiding the travelling tool."

[Printed, 10*d*. Drawing.]

A.D. 1863, March 11.—N° 668.

BARCLAY, Andrew. — " Locomotive boring and winding " engines."

Under one modification the boiler of the engine forms the framing. The boiler is horizontal, and carries a pair of standards supporting the beam. One end of the beam is worked by a pair of vertical cylinders, the other carries the boring rods. A horizontal cylinder works a crank shaft, which in its turn drives a winding barrel, capable of being thrown in and out of gear. The crank shaft may also be used to propel the engine, suitable guiding apparatus being provided.

Another mode consists in driving the crank shaft by " a pair " of right-angled cylinders arranged at the side of the framing."

The boiler here is vertical, the funnel serving also as the beam support.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1863, March 21.—N° 753.

EVANS, ISAAC MARK, and GRIFFITHS, WILLIAM THOMAS.—(*Provisional protection only.*)—Ventilating mines.

A tower or chimney is erected near the top of the up-cast shaft, and placed in communication with the mine. Air is heated by being passed through fire-clay pipes, and is then turned into the chimney at the bottom. A steam jet is further fitted in the tower or chimney near the top, above which steam jet there is further fixed an inverted cone or dome for the purpose of regulating the draught. This tower may be widened out near the top. A drain is provided at the bottom to remove the condensed water.

[Printed, 4*d*. No Drawings.]

A.D. 1863, April 9.—N° 903.

LOW, GEORGE.—Boring machinery.

The tool is attached to a piston rod working in a cylinder, which is caused to slide forward as the work proceeds by a self-acting worm and screw motion. The steam or air is admitted to the cylinder by a single valve "operated by a rock lever" "set in motion by means of a connecting rod attached to the "piston rod. The rock lever when used moves a pawle in "contact with the teeth of a ratchet wheel, the axle of which "carries a worm in gear with a worm wheel on the piston rod, "and by this arrangement an axial motion is given to the "boring tool. The rock lever is connected by links to a bell "crank, which, by pressing on the end of the valve rod, gives "motion to the valve in one direction. The return is effected "by means of a coiled spring or its equivalent. The length "of the valve rod is made adjustable, to regulate the 'cut off.' "The steam escapes into the interior of the piston through "grooves in the cylinder, and there meeting a jet of cold "water, is condensed. The water and condensed steam then "rush out through holes made in the hollow boring tool, and "entering the hole which is being bored in the rock, thereby "keeps it clean." The piston is returned "partly by vacuum

" caused by condensation, and by a very small passage of " steam independent of the valve. The horizontal and rotary " motion of the tool is effected during the backward motion of " the piston." When the rock is to be blasted, the machine is retired, disconnected from its pipes, and protected by an iron shield. The tools are of various shapes, hollow and solid. Various methods of supporting the machinery are described; it is also illustrated as adapted to well sinking. In this case it is attached to a kind of cage suspended by chains.

[Printed, 2*s.* 6*d.* Drawings.]

A.D. 1863, April 15.—N° 949.

SPENCE, William. — (*A communication from Samuel Ricker.*)—Powder for blasting and other purposes.

This powder consists of the following ingredients and proportions :—Firstly, water 38 parts by weight, charcoal 2 parts, chlorate of potash 20 parts, "mixture A" 6 parts, sawdust or pulverised bark 7 parts. "Mixture A" consists of pulverised coal 2 parts, bicarbonate of soda or nitrate of lead or saltpetre, or their equivalents, 3 to 4 parts.

Secondly, water 20 parts, charcoal 1 part, chlorate of potash 10 parts, bi-carbonate of soda (or the nitrate above mentioned or equivalents) 3 to 4 parts, coal ¾ part, sawdust or bark 3½ parts.

Thirdly, chlorate of potash 10 parts, wheat flour 2 parts, charcoal 1 to 2 parts, coal 1 part, water 3 parts.

Fourthly, chlorate of potash 10 parts, wheat flour 2½ parts, bi-carbonate of soda ¾ part, charcoal 1¼ part, coal 1¼ saltpetre 1¼ part.

These mixtures are effected in various ways according to the nature of the powder.

[Printed, 4*d.* No Drawings.]

A.D. 1863, April 28.—N° 1072.

DONISTHORPE, George Edmond. — Securing coal-cutting machines.

" The object of this invention is to obtain the requisite sta- " bility and capability to resist vibration when a light carriage " is employed; this is accomplished by applying a wheel or " wheels to the carriage to act against the roof of the working " in addition to the wheels which rest on the rails or ways

" along which the carriage is moved from place to place in " the" mine; "and such additional wheel or wheels is or are " pressed elastically against the roof of the mine; this is most " conveniently done by means of a piston in a cylinder con- " taining compressed air acting directly, or by interposed " levers on the axis of the wheel or wheels in contact with the " roof; other suitable means of obtaining the requisite pressure " may however be resorted to."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, May 1.—N° 1095.

GRAY, JOHN MCFARLANE.—Machinery for "rivetting, caulk- " ing, chipping, and otherwise operating upon and treating " metals and other substances."

These improvements are declared to be applicable to "mining, " and tunnelling" purposes.

In these machines the "hammer head or striking part is " fitted in the cylinder, so as to form a loose end thereof" and is not connected with the piston. It is held in its place by a screw cap and is furnished with a spring to return it into position to receive a fresh blow. This blow is given by a kind of shuttle piston or bolt which travels to and fro in the cylinder or tube.

Various descriptions of valve gear or apparatus are described, being self-acting at each stroke of the piston. They consist of " an arrangement of inside tappets;" "an arrangement where- " by the slide valve is moved in one direction by an inside " tappet, and in the other direction by the direct action of " steam and piston connected with or forming part of the slide " valve;" and, further of "an arrangement whereby the slide " valve is moved in both directions by the direct action of " steam upon pistons connected with or forming parts of the " slide valves, or communicating motion thereto."

[Printed, 2*s.* Drawings.]

A.D. 1863, May 15.—N° 1225.

MALLET, ROBERT TREFUSIS.—"Improvements in the con- " struction of piers, walls, and other similar structures, and of " landing stages, and in the connections therewith, or attach- " ments thereto." The inventor describes the improvements as being also applicable to the construction of "covered ways, "sewers, or tunnels."

The patentee sinks two rows of iron caissons, close together, one row on each side of the intended structure. Upon these caissons he erects a coffer dam of buckled plates bolted on to framing, which is placed between piles. The piles are also grooved so as to allow a cross partition of plates being placed here and there between the parallel rows. Thus by means of two of these transverse partitions a chamber or dam is constructed in which, after the water has been removed, the work may be constructed. As soon as a length has been completed another division is built up, and the water is prevented from entering by building round the finished work a partition of buckled plates with india-rubber packing or clay puddle. This last portion fits the outline of the work as closely as possible, and the elastic packing or puddle makes it water-tight.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1863, May 25.—N° 1319.

BURTON, John Watson, RHODES, Samuel Gibson, SEANOR, Samuel Exley, and SCRUTON, William. —(*Provisional protection only.*)—Coal cutting machinery.

The bed of coal is "pierced with one or more cutters, "having a reciprocating motion imparted, by preference, by "a V or other slide socket or sockets," actuated by "links "attached to a bell-crank lever" worked by a cam. The depth of the cut is regulated by this cam or its equivalent. The cutters are preferably "of the gouge pattern, and in some "cases the rasp pattern." The tool is moved in the direction required, at right angles to itself, by means of a ratchet wheel, connected by gearing with the V slide above named. "After "each return of the cutter or cutters" the ratchet wheel moves the frame so much as may be required to present sufficient surface to the cutter.

[Printed, 4*d*. No Drawings.]

A.D. 1863, May 26.—N° 1322.

MUNRO, James, and SCOTT, Robert.—Boring and winding machinery, coal cutting machine, &c.

This invention relates partly to working reciprocating boring rods by suspending them to the periphery of a drum fitted with segmental cylinders and pistons, after the manner of many rotary engines. The rods are so suspended as to allow for the jerks of the descending rods, a little slack being let out for the purpose. Various methods of effecting the suspension are described.

The invention also relates to a coal cutting machine. Cutters are fitted to a drum worked as above, and these cut deep slots in the coal.

For winding, two drums are supported on a portable framing and worked by steam cylinders. One drum carries a double ended rope, one end paying out as the other is wound in, so that one end is always immediately available for lifting. The other drum is for winding the rope, by which the sludge pump is raised and lowered. Frictional appliances are fitted to relieve against excessive strains, and springs support the rope pulleys.

Mine shafts are also to be sunk by means of massive rams, working in guides, and fitted with chisels. The ram is traversed over the place to be excavated, and the spaces between the lines are then broken up in the ordinary way.

The improvements also comprise a portable boiler for working the above machinery, a steam guage, and a machine for excavating for railway and other like purposes.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, June 8.—N° 1420.

JONES, James Grafton, and RIDLEY, Robert.—Coal cutting machinery.

The machinery is carried on a truck of a size suitable to run on the trams in mines. When a lever pick is employed, it is arranged to turn on an axis at one end of the truck, the power being supplied by a compressed air cylinder. A trunk works in the cylinder and communicates motion by means of a connecting rod, to the pick. The compressed air acts on the smaller side of the piston to return it for the next stroke. The connecting rod works either of two crank axes, to which the pick levers are attached, as may be desired, the connecting rod being pin jointed to the crank on either. Each axis or shaft carries an arm for working the slide valve. The arm works, by means of a connecting rod, a sliding frame. The latter has a friction roller which acts on an adjustable curved bar attached to the valve rod.

When a sliding pick is used, the connecting rod of the trunk gives motion to a lever arm on an upright shaft, which by another lever arm gives motion to the sliding pick by means of a link.

[Printed, 1*s*. Drawings.]

A.D. 1863, July 13.—N° 1745.

BARTON, JOSEPH.—(*Provisional protection only.*)—Guard or fence for pit mouths, &c.

The pit mouth is surrounded by fencing, in which openings are left for gates. The pit guides project above the surface of the ground and are fitted with a system of levers by means of which the gates are opened and shut at the proper times. "The sliding or movement of the gates" "is effected by raising "and lowering the cage." Clips are attached to the cage and embrace the guides. "As the cage is raised, the upper clip "forces the upper lever outward, and opens the gates, and on "its descent the lower clip closes them."

The apparatus may be adapted to gates lying in a horizontal or angular position.

[Printed, 4*d*. No Drawings.]

A.D. 1863, July 25.—N° 1857.

GAY, PAULIN ETIENNE.—Boring apparatus.

A cylindrical tube or drum, fitted with a number of cutters round its edge is rotated against the rock or other substance to be bored. By means of weights the pressure is regulated and a stream of water keeps the work clear. When used in tunnelling jack screws steady the machine. The cutters vary according to the hardness of the substance to be operated upon, steel being used for chalk or gypsum soils and diamond for granite. A guiding or central boring bar advances at the same time, into the rock, and prepares a drift or bore hole for the reception of powder, by means of which the rock is broken up.

In order to enlarge a cavity for the powder, without the use of acids, small saws attached to a rod are used. When inserted in the drift or bore hole, the rod is forced down by a screw, upon which eccentric pieces cause the saws to describe semicircular arcs, rotary motion being at the same time communicated by a crank handle.

To prevent the earth falling in, the sides of the work are tubbed with "plankings having sheet iron joints, and where "there is much water a packing of india rubber or other "suitable substance, which may be pressed out against the "sides by spiral or other springs, can be employed."

[Printed, 8*d*. Drawings.]

A.D. 1863, July 30.—N° 1888.

FIRTH, William, and FIRTH, Samuel.—Coal-cutting machinery.

This invention relates to improvements upon the machinery described in the Specification of the Patent granted to Donisthorpe, Firth and Ridley in 1861 (N° 2977).

The apparatus is now mounted in such a way that it is enabled to follow the angles of dip and rise in the seams, the purpose being to work the pick at right angles to the face of the coal, notwithstanding the angle. This effect may be obtained by the use of various size wheels to the truck or by alterations in the carriage.

Another improvement consists in adapting an expansion "chest to the air cylinder to obtain a better supply of compressed air to work the piston."

Oscillating instead of fixed cylinders are also used, by which the length of the machine may be increased, the connecting rods being dispensed with. Various methods of connecting the piston rod with the lever are shown. A mode of using a fixed air cylinder is illustrated.

The invention also relates to an improved mode of loading trucks from shoots, by which the breakage of the coal is reduced.

[Printed, 10*d*. Drawing.]

A.D, 1863, August 10.—N° 1971.

CUNNACK, Richard John.—(*Provisional protection only.*) —Cartridges for blasting.

The object of this invention is to provide a highly compressed charge which will not shrink on being subjected to pressure in tamping, and thereby induce the entry of water into the case.

The explosive material may be confined in a flexible metallic tube, "and by the admixture with the explosive material pre-

" vious to its formation into cartridges of a resinous, gummy, " or other adhesive material; the use of an external case may " be either wholly or partially dispensed with."

[Printed, 4*d*. No Drawings.]

A.D. 1863, August 15.—N° 2021.

YATES, George.—Indicating the quantities of minerals drawn from shafts.

As each tub or other measure ascends the shaft, a projection acts upon a star wheel which communicates motion to gearing and pointers on a dial plate. " The number of tubs or " measures constituting a quarter having ascended, the gear- " ing will communicate motion to the finger or pointer on " a second dial plate, " and register the quarter," and so on.

Apparatus is provided by means of which the pointers can be caused to abstain from registering when men are being raised from the mine.

[Printed, 10*d*. Drawing.]

A.D. 1863, August 18.—N° 2049.

DOBB, Thomas. — " Chimney tops," also " applicable to " coverings for ventilating shafts or flues from mines."

The top of the chimney or flue is made up of two tubes in the shape of truncated cones, placed base to base with a space intervening. A larger cone, base downwards encases the pair, an annular space being left. The uppermost of the pair has a horizontal fan wheel. The lower end of the outer hood projects below the opening between the two first mentioned cones, and any wind that may enter this way will rise and escape at the top of the hood. If any pass into the chimney top through the opening, it also will ascend and aid in driving the fan wheel.

The apparatus is also modified in a manner, for the purpose of causing all the wind which enters the hood to pass out through the chimney top. In this case there is no annular space between the hood and upper cone.

[Printed, 8*d*. Drawing.]

A.D. 1863, August 26.—N° 2110.

NEWTON, William Edward. — (*A communication from Melchior Colson.*)—(*Provisional protection only.*)—Winding apparatus.

"Several round cords or cables" are used "instead of the "single flat cable." "These round cords are passed round "an upper and lower drum; the upper drum may be driven "in either direction by any suitable motive power, and thereby "made to communicate motion to the round cords."

A "suitable heating apparatus" is placed "under the drum "around the cords to counteract the injurious effects of "humidity." "The cords are attached to iron traverses, by "which the cages as well as the lower drum are suspended, "and the cages may be adjusted at any required height by "means of screws. The unloading of the cages which are "drawn to the surface is commenced before those at bottom "rest entirely upon the apparatus for their reception. The "total weight of the cables, and also that of the cages and "unloading vessels, and the lower drum, rest upon the upper "drum."

[Printed, *4d.* No Drawings.]

A.D. 1863, September 12.—N° 2251.

SUTHERLAND, Douglas Symonds.—"Blasting rocks."

The inventor makes use of a wedge acting tamping block, consisting of a cone placed base downwards on the charge, and pierced axially for the fuse. Sand is placed above and around the cone. To increase the beneficial effect a ring of india-rubber or leather may be fitted to the base of the cone, to act as a gas check. The cone may be made up in a piece with the cartridge and even the sand may also be added up in this way. This plan is suggested for horizontal holes and when the saving of time is an object.

[Printed, *6d.* Drawing.]

A.D. 1863, September 21.—N° 2327.

RIDLEY, Robert, and JONES, James Grafton.—Working picks in mining machinery.

Wire helices are placed in curved lines on the platform of the machine, and working through them are curved bars, made up of sections of soft iron and some non-conducting material. These bars are in connection with the central axis which communicates motion to the picks. When a current of electricity is sent through a helix, the soft iron part of a curved bar is attracted to it; on breaking contact, and making contact with the next helix, a similar effect will be produced on another soft iron part. Another arm, acted upon in a similar way, produces the retrograde motion, thus communicating a reciprocating movement to the axis.

"When other than lever picks or cutting tools are used on "a carriage," then straight bars and helices may be employed.

[Printed, 1s. 4d. Drawings.]

A.D. 1863, September 24.—N° 2353.

DRONKE, Ernest.—(*A communication from Edward Schultze.*)—(*Provisional protection only.*)—Gunpowder for blasting and other purposes.

This powder is made by treating grains of wood with alkalis for the purpose of purifying them, and then with "chloride" and "nitrous acid." These grains are not explosive in this stage, but they are rendered so by nitrate of potash and "in "some instances by kali-ferro-hydrocyanicum."

When it is intended that the powder shall have a gradual action, the inflammable and not explosive grains are to be ground to powder, which is afterwards rendered explosive. A cake is then made of the powder and granulated.

[Printed, 4d. No Drawings.]

A.D. 1863, September 24.—N° 2357.

STURGEON, John.—Coal, &c. cutting and boring machinery.

The valve gearing for this machine is an adaptation from an improved steam hammer for which Provisional protection was granted to the inventor in 1863 (No. 1292). This Provisional Specification is abridged in another series and does not appertain to this. It is self-adjusting to suit different lengths of stroke. "To ensure the self-adjustment," "that part of the "valve motion which reverses the valve for the back stroke," "is connected" to "the piston rod, so as to cause it to traverse "with the piston rod, and thus be in position for reversing at "any point in the stroke." "The shock or jerk caused by the "cutting tool striking against the coal, rock, or other sub-"stance," is employed "to set in motion an arrangement of "rock levers, whose office is to transmit this sudden motion,

" directly or otherwise, to the valve rod, and thereby reverse " the stroke. This arrangement of levers carries a bowle, " which by striking against a fixed stop at or near the com- " pletion of the reverse stroke, again shifts the position of the " valves and produces the return motion of the piston."

The feed motion is arranged in such a way that the tool is obliged to penetrate to a certain depth before it can set in motion the advancing gear. This may be variously effected. One way is as follows :—" A pawl or ratchet actuated directly " from the piston rod" or first motion shaft "is so arranged " that at any required point in the stroke it will be allowed to " fall into the teeth of, and drive a ratchet wheel" by which the carriage is advanced. "The ratchet wheel is mounted " between two adjustable fixed segment guides, which are so " shaped as to keep the pawl or ratchet out of the teeth of the " ratchet wheel until the determined length of traverse of the " cutting tool has been effected. This pawl is fitted with a " compound stud, one end being rigid, and the other capable " of yielding to endway pressure. The yielding end slides " upon one of the said segment guides, and the rigid end " upon the periphery of the other. So long as the traverse " of the tool is short of the determinate distance the pawl will " be supported by the yielding stud out of action, but when " the proper length of stroke is obtained, the pawl will drop " or be forced inwards, its stud coming in contact with the " segment guide of smaller radius. In traversing over this " guide the stud will meet a depression, and the pawl will " then be thrust into contact with the teeth of the ratchet " wheel before mentioned. In the continued traverse of the " pawl the requisite axial motion will be imparted to the " ratchet wheel for" effecting the advancement of the machine. " The ratchet will then be raised to its elevated position, the " stud yielding to allow of that elevation. To provide for the " proper traverse of the machine when the stroke of the tool " is shortened, the segment guides are made capable of " adjustment of a shorter stroke ; the pawl may fall as above " explained into contact with the teeth of the ratchet wheel."

The machinery is also described as fitted to an oscillating cylinder.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1863, September 24.—N° 2359.

NEWTON, Alfred Vincent. — (*A communication from Alfred Nobel.*)—Blasting composition.

Nitro-glycerine, or the nitrates of ethyl and methyl are mixed with gunpowder, gun cotton, or other analogous substance. "By this mixture the exploding force of every fulminating substance may be tempered or regulated, or if it be a liquid the heat generated by ignition may be transmitted through the mass at the degree necessary to cause explosion." When retardation only is desired, some other fluid, as oil, may be used. The nitro-glycerine will replace to some extent the saltpetre.

[Printed, 4*d*. No Drawings.]

A.D. 1863, September 30.—N° 2398.

ELLIOT, George.—"Props and supports for mines."

This invention consists in making the supports of wrought iron. They may be solid or hollow or star or cross shaped in section. Shoes of metal or wood are employed to support the props, and iron or wooden blocks are interposed between the tops and the cross pieces. The cross pieces may have the two ends "bent at right angles, or nearly so, in order to grasp the interposed blocks or top pieces or the props, and prevent their coming loose, owing to the deflection of the horizontal cross piece."

[Printed, 6*d*. Drawing.]

A.D. 1863, October 7.—N° 2459.

GIBSON, John.—"Cast-iron pit tubbing."

This invention consists in protecting from corrosion the surface or outer face of the tubbing by casting it against a chill plate, the back of the segments being cast in the ordinary sand moulds.

[Printed, 6*d*. Drawing.]

A.D. 1863, October 16.—N° 2531.

POLGLASE, James, and COX, Jonathan. — Boring and cleaving stone.

"The machine consists of a frame, in which are arranged "any desired number of jumpers similar to those used in

" stamping machines, steel drills being attached to the lower
" ends thereof. The jumpers and drills are actuated by means
" of a horizontal shaft provided with bevelled cams or tappets.
" Upon the shaft being caused to revolve, the cams or tappets
" act upon corresponding projections on the jumpers or drill
" stems, which, by reason of the bevel of the cams or tappets,
" are partially turned round, and are thus caused at each depression to strike upon a different part."

The jumpers are fitted with collars, and the upper horizontal guide bar is furnished with india rubber cushions, so that when the drill has done its work the machine may not be damaged by shocks on the guide bar. To raise the jumpers the guide bar is lifted. Hooks are provided by means of which any or all of the jumpers may be held out of action.

The machine may also be used to drive wedges into holes previously bored.

It is claimed to be useful "in drilling holes for blasting rock
" in a perpendicular direction, and also for boring for coals
" and other minerals, and to boring for water for the supply
" of artesian wells."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1863, October 19.—N° 2555.

BUDENBERG, Arnold.—(*A communication from Bernhard August Schäffer and Christian Friedrich Budenberg.*)—
" Blasting powder."

This powder consists of a combination of from 30 to 38 parts of nitrate of potash, 40 parts of nitrate of soda, 8 to 12 parts of sulphur, 7 to 8 parts of wood charcoal, 3 to 4 parts of common coal, and 4 to 6 parts of potassio-tartrate of soda. This composition is claimed to burn slowly and perfectly.

[Printed, 4*d.* No Drawings.]

A.D. 1863, October 22.—N° 2600.

MITCHELL, James. — (*Provisional protection only.*) —
" Sinking, quarrying, and excavating."

The bore holes are sunk vertically in the usual manner to the required depth. They are then filled with malleable iron plugs of a conical shape, and leaden caps, which are gradually extracted as the rock is blasted downwards, they serving to keep back the water. When the bores are sunk and plugged the plugs are removed to a given depth, the charge inserted and fired, and so on.

Iron tamping plugs may also be used, combined with lead "caps," and above them other iron plugs.

[Printed, 4*d*. No Drawings.]

A.D. 1863, October 24.—N° 2624.

CREASE, Edward Smith.—Rock boring machinery.

This invention consists, firstly, in constructing apparatus for the above purpose, by placing two cylinders side by side, "one cylinder being of greater diameter than the other, the "pistons which work in these cylinders and the ports or "passages which connect the cylinders being arranged in "such manner that each piston acts as a piston valve to the "other," without the use of tappets or levers of any kind.

Secondly, the feed motion is imparted "to the borer or "boring tool by connecting the feed screw to the spindle "inserted through the end of the cylinder by fixing on the "screw at the same end of the cylinder a ratchet wheel with "lever and paul working loose on the same and connecting "this lever with an eccentric fixed on the spindle" for varying the feed. The boring tool is worked by the piston rod of this cylinder.

[Printed, 8*d*. Drawing.]

A.D. 1863, October 24.—N° 2630.

LOCKE, William, WARRINGTON, John, CARRETT, William Elliot, MARSHALL, William Ebenezer, and TELFORD, John.—Coal-cutting machinery.

The motive force for this machinery is derived from the pressure of water or other non-compressible fluid. The piston has a trunk in which the tool bars are fitted. The return stroke may be produced by springs or weights, or by causing the inferior area of the piston to be constantly open to the pressure of the water. The motive cylinder may also be double acting. The machinery is mounted on a carriage, provided with additional leading and trailing wheels, which may be raised for convenience of transport. In order to ensure stability, a "holding-on head" or "feeler" is used. This is made to reciprocate by water pressure, or by the pressure of air against water, and to press against the roof during the cutting action, and to be released to allow the machine to move forward during the return stroke for another cut.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1863, October 27.—N° 2659.

FIRTH, William, FIRTH, Samuel, and STURGEON, John.—Coal, &c. cutting machinery.

This invention consists in the following improvements:— A holder for the tool formed with a dovetailed recess in which the tool is tightened by means of a strap or wedge; or formed with hinged sides which hold the cutter the more firmly in proportion to the strain; or formed with a recess to fit a corresponding projection, the tool being held by a key, or the tool may be held by a spring catch.

Utilising the exhaust air with water spray, to clear the grooves and to diminish dust.

Employing a "ratchet wheel, pawl, and lever, in connection " with the working apparatus for propelling the machine" instead of using a hand wheel.

"Placing the engine for giving motion to the pick in a " transverse position on the frame, so that the blow may be " delivered by the pull on the crank arm instead of by the " push, as has hitherto been the case, using for this purpose " either the oscillating or parallel motion engine."

"Placing the spindles in the two opposite corners at one " side of the machine instead of at the end, whereby the " necessity of turning the machine round to 'set in' is " obviated." The piston rod works through both ends of the cylinder, or the latter is made to swivel round.

Combining a straight cutter with the pick, to be effected in various ways, and causing the spindle to traverse with the pick instead of making the tool only moveable.

"Facilitating the first cutting or opening of the groove by " means of a to-and-fro cutter." This is "effected by im- " parting a shifting motion to the cutting tool by the rocking " of the cylinder."

"The application of double flanged wheels for propelling, " or wheels with a flange on one side only, the other side " being supplied with a loose washer, serving the same " purpose as a flange."

Adjusting the tool to any angle by mounting the engine on a separate hinged frame.

The application of a "cambrian or vibrating piston engine " to work" the tool, the engine being placed vertically or horizontally according to requirements.

The application of hydraulic pressure against the roof and sides to secure the machine.

[Printed, 2*s*. Drawings.]

A.D. 1863, October 28.—N° 2671.

DONISTHORPE, George Edmond.—Coal-cutting machinery.

There are two improvements claimed under this invention.

Firstly, the use of wedges on the sides of the rails upon which the carriage runs, which wedges enter between the rails and the frame of the carriage, or a projection therefrom, and thereby steady or secure the carriage. "The wedges are " drawn in by means of springs, each tending constantly to " draw its wedges into the space between the side of the rail " and the frame or projection."

Secondly, in the use of a clearer, worked with the pick, in such a manner that at each stroke and return of the latter the clearer returns and rakes out the small behind the pick.

[Printed, 10*d*. Drawing.]

A.D. 1863, November 9.—N° 2786.

PHILIPSON, Ralph Henry, and DEES, John.—(*Provisional protection only.*)—Machine "adapted for performing " various mining operations, such as working or cutting coal " or other analogous substance in mines, forcing water from " mines and air thereunto."

"A suitable framing supports the following parts :—A large " screw works through a screwed nut or block moving in " grooves or guides ; to this block a pick or cutter is affixed " and worked by bevil wheels, which cause the aforesaid screw " to revolve. The direction of motion is reversed when neces-

" sary by a clutch worked from the main shaft of the machine " by excentrics or other suitable means. The aforesaid bevil " wheels receive motion from a pinion wheel driven by another " wheel and pinion attached to the same shaft; this last-" mentioned pinion is driven by a wheel running on another " shaft, to which another pinion is attached; this pinion " receives its motion from a bevil wheel on the main shaft of " the machine. The machine may be mounted on four wheels " to run on a tramway; two of said wheels are double-flanged, " and are moved forward by a worm and worm wheel worked " by a ratchet connected with an excentric fixed on the main " shaft of the machine. A lever is employed for throwing the " wheelwork out of gear for moving the machine backward " when necessary. One or two fly wheels may be fixed on the " main shaft aforesaid to assist the working of the machine."

[Printed, 4*d*. No Drawings.]

A.D. 1863, November 13.—N° 2837.

HARRISON, THOMAS.—Coal cutting machinery.

The inventor mounts a turbine upon a truck or carriage. The vertical axis of the turbine carries two cams, which, as the turbine rotates, work upon the shorter ends of a pair of levers, the longer ends carrying the picks. This pressure on the shorter ends, withdraws the picks from the coal, and upon the pressure being removed, sufficiently powerful springs return the picks with force to cut into the coal. The inventor prefers to use compressed air to drive the turbine.

[Printed, 8*d*. Drawing.]

A.D. 1863, November 18.—N° 2888.

WIGFALL, WILLIAM, and JOLLY, GOTTLIEB.—(*Provisional protection only.*)—"Explosive compound" "to be used in the " manufacture of cartridges for fire-arms and ordnance, and " to supersede the use of flints or percussion caps for ex-" ploding such cartridges." "It may also be used for blasting " and mining purposes.

The following ingredients and proportions are given, subject to variation :—Carbon, 4 parts; gums, 4 parts; aqua fortis, 6 parts; red lead, 40 parts; phosphorus, 4 parts; sulphur, 2 parts; chlorate of potash, 26 parts; sugar of lead, 6 parts; cannel coal, 1 part; saltpetre, 3 parts; steel filings, 4 parts.

No description of its use in blasting is given, except that it may be used in a cartridge.

[Printed, 4*d*. No Drawing.]

A.D. 1863, November 30.—N° 3000.

JAMES, Enoch Watkin.—Drilling and boring rock, &c.

This tool, which is "chiefly intended for boring in an oblique " or horizontal direction" "consists of a boring rod or tube " having two water passages formed through its entire length, " one for the admission of water and the other for the discharge " of water and debris." The former passage "is fitted with " a valve, to prevent the return of the water as the rod advances in contact with the rock." The cutter is formed in the shape of a star or cross, between the rays of which the water passages are introduced. An external water tube may be connected to the internal tube or passage by means of an universal joint or otherwise. The boring rod is fitted with a cam at the rear to provide rotation. It may also be made in lengths, coupled together in any convenient manner.

When the earth has to be punctuated to any great distance, the bore hole is enlarged at convenient distances, so as to receive bearings of metal in which the tool is to work for the relief of friction. These enlargements are made by an expanding cutter, and the bearings are introduced by a peculiarly shaped rod.

"Concussion may be applied to the bore rod by hand, or " through a suspended weight actuated by hand, or by steam " or other motive-power engine direct."

[Printed, 10*d*. Drawing.]

A.D. 1863, December 2.—N° 3034.

HARRISON, Thomas.—Coal cutting machinery.

This invention relates to improvements upon that for which Letters Patent were obtained in 1863 (No. 2837.)

A turbine is mounted upon a carriage and its axis is fitted with a toothed pinion, which takes into another pinion on another axis or spindle. Upon this latter axis is placed a circular revolving cutter, or a disc having a serrated edge. " Instead of such a cutter, the axis of the toothed wheel may " have fixed upon it a hollow circular box or frame, into which " may be fixed any required number of cutting tools." The whole apparatus is mounted on a sliding frame on the carriage, so as to be brought to and from the coal.

In cutting longitudinal grooves, the truck runs on a railway. In making vertical grooves, "the truck carrying the machinery "must be mounted so as to work upon slide or guide bars "upwards or downwards as desired."

"When it is desired to cut a groove of a variable width "tapering from front to back," the patentee places "upon the "circular frame two or more tiers of cutting tools arranged "one above another or spirally, so as to come in operation in "succession."

The turbine may be worked by steam, water, or compressed air.

A machine for tunnelling purposes is also described. A number of cutters work out a circular groove in the face of the working, and a central tool drives a hole for the reception of a blasting charge.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, December 7.—N° 3066.

FIRTH, WILLIAM, FIRTH, SAMUEL, and STURGEON, JOHN.—"Machinery or cutting and boring coal, stone, other "minerals."

This invention consists in the following improvements :—

Hydraulic wedging down apparatus. A vertical cylinder, its ram wedging against the roof, carries a small horizontal hydraulic cylinder to the ram of which the wedge is attached. When the vertical ram is secured, the wedge may be forced into the coal, and if necessary, moved vertically by a screw shaft attached to the vertical cylinder and moving in lugs in the horizontal cylinder. By another method a hole is bored, and a small cylinder and ram inserted. This ram, when supplied with water by the pump, forces down the coal.

In various methods of employing "cambrian or vibrating "piston engines." To the piston may be fitted a plate having a radial slot in which is fixed the stud of the connecting rod. The other end of the connecting rod works a crank for imparting motion to the pick through a spindle. This spindle may be moved up and down through the boss of the crank. Or the tool may be fitted to the connecting rod, the latter being guided in its work by a crank. The up and down movement may be imparted by raising and lowering the framing. By means of the radial slot, the length of stroke may be varied. The cylinder may be swivelled round, so that the picks may be worked from any corner of the machine.

For vertical cutting work, one or more cylinders may be mounted on a vertical frame, and moved by hydraulic or other power. This frame may be mounted on a base plate moved about by a screw or cog wheels.

By another improvement, the spindle carrying the tool may be made to work through the axis of the vibrating piston, so as to receive motion direct. Rotary motion may be imparted instead of reciprocatory motion. A pick may be balanced by a weight on the opposite side of the spindle, or by weighting the spindle itself on the side opposite the pick.

Instead of the canting spindle described in the inventors Provisional Specification of 1863 (No. 2659) "to suit the re-" quired angle of inclination, rails may be used of unequal " section, that is one rail higher than the opposite rail."

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1863, December 24.—N° 3265.

BOWDITCH, William Renwick.—(*Provisional protection only.*)—Supplying air to lights in mines.

Air is compressed into a receiver, and thence conveyed by pipes to the lantern or lamp. It flows into the lamp at the bottom, and apertures for the exit of the products of combustion are provided. "The air being supplied to the lantern " under pressure prevents the entry of fire-damp and of any " other dangerous gas which may surround the lantern." To regulate the force of the supply, impediments, such as taps, plugs or wire, are fitted to the pipes.

The waste air from engines may also be used. The inventor also proposes to use compressed air by allowing it to escape under and around unprotected lights.

[Printed, 4*d.* No Drawings.]

1864.

A.D. 1864, January 12.—N° 90.

BARTHOLOMEW, Charles.—" Improvements in working " coal, and in apparatus employed therein."

The object of the invention is to provide for the breaking down of masses of coal without the use of powder. By one method a hole is drilled into the face of the coal, and its end enlarged by means of a tool, from the sides of which cutters are projected as it is pressed against the end of the hole. This enlargement is not necessary where there is a "back or seam " sufficiently open for water to penetrate." When the hole is prepared, a pipe is inserted and plugged. Hydraulic pressure is applied, and the block forced down.

The same results may be obtained by means of a screw apparatus. The end of the hole is enlarged to the shape of the frustrum of a cone. A hollow cylindrical shaft is then inserted, and its end opened out, to form a cone or lewis in the enlargement, by means of a rod passed down the centre of the shaft. As the apparatus is screwed this rod presses against the end of the hole, the shaft and lewis head being screwed outwards in the opposite direction, to break down the coal. A hydraulic press may also be used to work this apparatus.

Again, a solid rod with an enlarged head may be inserted in the hole, which is then firmly plugged with coal dust. The rod may then be actuated to detach the coal.

All these methods may be used with or without undercutting, and several holes may be simultaneously worked by steam or hand, or both.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1864, January 13.—N° 100.

DENTON, William, and WHITAKER, Joseph.—Safety cage and preventing overwinding.

The chains coupled to the main rope and suspending the cage are also attached to two catches working loose on studs fixed to the upper part of the cage. "The catches have curved " slots cut in them, such slot ways being struck from the " centres of the studs; each slot contains a curved block of

" less length than the slot, so that when the suspending chains " are tightened by the weight of the cage, the catches will " turn on their centres, the points of the catches opening or " descending until the bottom of each slot comes in contact " with the bottom of its block, four of which form the bear- " age of the cage. A spring is bolted to each block ready to " bring the points of the catches back to the" pit guide. " When the rope slackens or breaks, these springs act upon " or under projecting headed studs near the points of the " catches. The heads keep the springs in their places." The catches are fitted with guides, and each catch is connected by " a bolt or stretcher to prevent their impinging on the cage " by the oblique pull of the chains."

To prevent accidental overwinding, "a C link with the bend " or hook very strong" is employed. "A guard prevents the " ring of the rope from slipping off the hook. The guard " has two snecks, over which two catches drop to keep the " guard in position. The catches are held down by two " springs bearing on studs, the ring and guard being jointed " at the bottom. The two catches are coupled together by a " tail piece inserted between them, and rivetted thereto." When near overwinding, "the tail piece will come in contact " with a cross beam," and "turning on a pivot set in the link, " the catches will be lifted from the snecks," allowing the separation of the link and guard.

[Printed, 6*d*. Drawing.]

A.D. 1864, January 16.—N° 122.

BALMFORTH, William, and ROBSON, Francis.—(*Provisional protection only.*)—Hoisting apparatus.

This invention relates to a combined engine and cranes, capable of being "readily removed from one quarry to another." They may be used for "hoisting stone or other material from " the bottom of a quarry or pit, and at the same time" for " hoisting or lifting the stone or other material from the top " of the quarry or pit into the waggons."

The engine is " by preference affixed to a boiler so con- " structed as to require the minimum of foundation, with a " crab or hoist placed on the top of the boiler (when the same " is horizontal)," and worked by the engine, and "also with a " second crab or hoist placed by preference on one side of the

" boiler and engine, and also worked by suitable gearing from
" the steam engine, the whole apparatus being in one compact
" frame."

"The boiler may be an ordinary cylindrical one," but it is preferred "to apply the heat underneath an iron framing lined
" with fire-bricks, and extending from one end to the other of
" the boiler forming the furnace and flue. The iron casing
" just referred to extends to the ground, and notches being
" cut in each side stones are placed within, which bear the
" weight of the engine and boiler in great measure, the
" remainder of the weight being borne by the iron casing,
" which may thus rest on a very light foundation. An ordi-
" nary foundation supports the second-mentioned crane."

[Printed, 4*d*. No Drawings.]

A.D. 1864, January 21.—N° 158.

DONISTHORPE, George Edmond.—Machinery for getting
" coal, stone, and other minerals."

In this machine double sets of picks or cutters are caused to work alternately by one cylinder and piston. The machinery is mounted on a carriage which runs on rollers on a tramway. One rail only of this tramway is truly laid, it being immaterial whether the gauge is accurately preserved by the other. Clips on the carriage embrace the former, which is also toothed to assist the progression of the apparatus. The machine is steadied by means of a ram pressed vertically against the roof. A horizontal cylinder works a horizontal bar pivotted at its centre. At each end this bar is attached to a cutter frame, which runs on friction pulleys in guides. The frames carry the picks or cutters, preferably similar to those described by the inventor in the Specification of a former Patent, No. 2671 (A.D. 1863), each pick being accompanied by a clearer. A contrivance is added, by means of which the clearer and pick are caused to come together and hold the debris between them as they retire. The leading pick is shorter than its follower, which deepens the groove cut by the former. These tools may be variously attached. Other mechanical means may be employed for communicating the alternate movement to the picks, and these may also be lever as well as sliding picks. They may be made to work also at angles.

When the cuts are to be vertical, the cutters "should be " carried by slides, each of which is carried in a separate " frame, upon which it is capable of moving upwards or " downwards in guides. The two frames are one above the " other."

[Printed, 10*d*. Drawing.]

A.D. 1864, January 21.—N° 160.

LEBRUN, Nicolas Joseph.—(*Provisional protection only.*) —Safety cage.

Two vertical serrated guide bars are placed in the shaft, between which and guided thereby is placed "a wrought-iron " or sheet-iron rectangular case, the two sides of which next " the said bars" are open, so that the machinery in the case may act on the teeth of the racks. Through the case passes a vertical rod, suspended from a rope or chain, its lower end carrying a "nut or plate, by which when the rod is drawn " upwards it carries with it the rectangular case, but it is " capable of limited downward motion through the bottom of " the case." An adjustable nut limits the extent of motion. The chest carries pawls, acted upon by springs, but maintained from the racks by chains attached to the suspending rod. Consequently the separation of the rod from its suspending rope would allow the pawls to fall into the racks and so support the cage.

[Printed, 4*d*. No Drawings.]

A.D. 1864, February 1.—N° 267.

JONES, James Grafton.—Coal cutting, &c. machine.

The bearings of the axis of the pick are mounted on a cylinder carried in bearings on the carriage. The piston rod of the engine works through this cylinder. The cylinder is capable of being revolved on its axis by means of toothed gearing, by which movement the working position of the pick is altered. The connecting rod is attached to the crank on the axis of the pick by means of a forked head, and turns with the cylinder carrying the tool, so as to be always in position to work correctly. The cylinder of the engine is mounted on a separate bed plate, arranged to turn on the fixed bed plate of the carriage, so as to be capable of adjustment to various positions. The slide valve is worked by the piston in completing its back stroke, striking against a rod passing through the rear cylinder cover; a lever is jointed to this rod, the other end being attached to the valve. A spring or elastic cushion works the return stroke of the valve, and a hand starting lever is added. The machine is progressed by toothed gearing worked by a hand wheel.

[Printed, 1*s.* 6*d.* Drawings.]

A.D. 1864, February 9.—N° 337.

CUNNACK, Richard John.—Blasting cartridges.

The charge is used in a highly compressed state, the powder being damped with some liquid hydrocarbon, and submitted to hydraulic or other pressure. The case is made of flexible metallic tubing, and the fuse is inserted in the centre, previous to charging. The use of a case may, however, be dispensed with, provided the explosive material be mixed with some resinous, gummy, or other adhesive substance, and then compressed. Solutions of shellac, resin, caoutchouc, &c., in hydrocarbons are recommended, or gum or glue dissolved in water. The fuse is inserted in the centre of the oiled mould, before ramming the composition.

[Printed, 4*d.* No Drawings.]

A.D. 1864, March 10.—N° 607.

BURDON, William Wharton. — (*Provisional protection only.*)—"Hewing or getting coal."

"This invention consists in the employment of a hammer or
" piston driven by steam or air to work upon a 'jemmy' or
" pick by blows on the head, while the pick or jemmy is held
" loose by a man or is attached to the piston, so as to loosen
" the coal at top, or bottom, or sides by elevating or lowering
" the piston or frame on which it stands."

It also consists "in the employment of a saw, circular or
" horizontal," worked by steam or air.

[Printed, 4*d.* No Drawings.]

A.D. 1864, March 10.—N° 611.

PENRICE, Hubert Newton.—"Improvements in machinery
" for tunnelling and driving galleries through rock and other
" strata."

In the Specification of a Patent dated the 3rd of June 1861 (N° 1386), the inventor proposed to combine the steam boiler with the machine, the whole being supported upon wheels.

In the combination, which is the subject of the present invention, the fore part of the engine and mechanism worked thereby is supported on feet or sledges and not upon wheels. These feet are adjusted by wedges and screws. "The hinder " parts of the machinery and the steam boiler are, as before, " supported by and move on wheels or rollers, but an addi- " tional pair of driving wheels is introduced between the " steam machinery and the boiler." The boiler is surrounded by a water jacket to keep down the temperature of the working and the escaped steam and furnace are made use of to facilitate ventilation.

[Printed, 1*s.* 10*d.* Drawings.]

A.D. 1864, March 24.—N° 744.

LEAK, Elias.—(*Provisional protection only.*)—Conducting sounds in mines, &c.

This invention, which is described in its application to railway trains, is claimed as being useful in mines for communicating sounds or signals from one place to another. The apparatus consists of speaking tubes of iron of suitable size, joined by couplings and fitted when necessary with branches, terminating in mouthpieces.

[Printed, 4*d.* No Drawings.]

A.D. 1864, March 26.—N° 762.

LEVER, Ellis.—Expanding flexible tubing used in ventilation.

Hoops of steel, wood, or other material, are rivetted or bolted to the flexible material "during the operation of sewing or " otherwise seaming the material to form the tube." To " some of these rivets or bolts," the patentee attaches "a ring " or partial ring to hang outside the tubing," by means of which the tubing may be suspended in the mines. "To pre- " vent damage to the flexible material by the friction of the " shoulders of the hooks, bolts, or rivets," a "washer of " leather or other suitable material " is placed between them.

[Printed, 4*d.* No Drawings.]

A.D. 1864, March 28.—N° 770.

HENRY Michael—(*A communication from Bénoist Rouquayrol.*) — "Supplying air to persons employed" when " noxious gas prevails."

The apparatus consists of a reservoir for compressed air to which is attached what is called an "air chamber," or " box." This chamber is fitted with an elastic cover which when pressed, communicates movement to a valve placed between the chamber and the reservoir of compressed air, and allows air to flow out. " The outflow of air may be regulated " by combining two such contrivances or air boxes, and " causing them to communicate with each other by a tube or " other connection through which air flows from one box to " another. The boxes may be surrounded by a casing and " springs used for pressing on the plates. A tube leads from " the air vessel to supply the workman who may wear a " mouth-piece consisting of a strip of caoutchouc held between " the lips and teeth. The action of the air valve is preferably " so regulated that the same air may be breathed twice." The apparatus may be carried on the back of the workman.

The pumping apparatus consists of a series of pump barrels each smaller than the other, the air being taken from the largest to the smallest in succession and so highly compressed. The pistons are fixed to the bed plate, the barrels moving vertically over them. A small pump worked at the same time, supplies a little water to each piston in order to make a tight joint. Or a pumping apparatus may be made up of two such moving cylinders, only of equal size. This machine is intended for use when smaller quantities of air at lower pressure are required.

[Printed, 8*d*. Drawing.]

A.D. 1864, March 29.—N° 775.

EVANS, Isaac Mark. — (*Provisional protection only.*) — Blasting.

The inventor proposes to charge tin or other metal tubes, with explosive gases, " and hermetically seal their ends, one " by solder (or equivalent means), and the other by inserting " therein a fuse, and packing such fuse as may be needful, the " fuse to be accompanied by a small portion of gunpowder (or " other equivalent explosive substance)."

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 30.—N° 786.

LANG, Joseph.—(*Provisional protection only.*)—Ventilating mines.

The object of the inventor is to obviate the necessity for forcing fresh air into mines. He accordingly proposes to withdraw the foul air by exhaustion and allow the fresh air to flow into the workings of its own accord. The exhaustion is to be effected by arranged pipes, perforated at intervals, in the workings, and placing them in connection with a fan or other apparatus for the same purpose.

[Printed, 4*d*. No Drawings.]

A.D. 1864, March 30.—N° 795.

NEWTON, William Edward.—(*A communication from Nicholas Joseph Jacquet ainé.*)—Rock boring machinery.

The tool, which is worked by hand, is held by a framing secured in the gallery by two points screwed upwards and downwards against the roof and floor. The bearings of the tool shaft are capable of being adjusted at different heights between the parallel sides of the framing, and they are also capable of being pivoted at a varying angle, and then firmly clamped. Through the bearings works a screwed shaft, through the axis of which rotates the boring bar, carrying the tool at its end. The screwed shaft is fitted, at the end furthest from the face of the working, with a nut having its rear face serrated. A lever is fitted to the end of the boring bar, which lever also has a pawl which, when the tool is to be advanced, is allowed to take into the serrations in the nut, and so rotates the screw shaft. The boring is effected by turning the tool bar by means of the lever. A racked bar may be used as a substitute for the screwed bar.

The hole may be enlarged by a tubular cutter bar, having a cutter capable of being projected laterally by means of a coned surface. This hollow bar may be made in lengths with bayonet joints. A ring furnished with steel filings may also be used fitted to the end of the bar. Water is forced into the bore through the hollow bar. "When the boring is effected
" in a downward direction, the hollow boring tools may be
" made in the form of a screw of quick pitch, so as to work
" the debris out of the hole."

[Printed, 10*d*. Drawing.]

A.D. 1864, April 9.—N° 895.

NISBET, John.—Machine for cutting coal, &c.

A carriage on wheels supports a horizontal engine, upon the crank shaft of which is placed a second crank at right angles to the engine crank. To this is attached a connecting rod, the other end of which works the short arm of the pick, or the rocking shaft to which the pick is fitted. The pick encounters the mineral when the piston is at about half stroke, the effect of the blow being intensified by the momentum of the flywheel. The carriage is moved by gearing along a racked way. The machine may be made to cut a horizontal groove or otherwise. In making a horizontal groove, the work is passed over several times, each passage deepening the cut.

The depth of cut may be adjusted in various ways; by altering the length of the connecting rod by a right and left handed screw coupling, or the bearings of the pick shaft may be made adjustable in the carriage. The axle of the hind wheel may also be raised or lowered when it is wished to alter the level of the cut.

[Printed, 10*d*. Drawing.]

A.D. 1864, April 11.—N° 900.

DRONKE, Ernest. — (*A communication from Edward Schultze.*)—Powder for mining, &c.

Veneers of wood are first prepared, and from them small regular shaped grains are stamped. These are boiled with alkali, and washed. They are then steamed to remove proteine, albumen, &c., and washed. They are then bleached by the application of chlorine or its compounds, after which they are treated with nitric acid mixed with sulphuric acid, again washed and the acid reaction neutralised with a weak alkaline solution. They may then be treated with nitrates.

The dust resulting from the various processes may be made into a paste with gum water, spread into sheets and granulated.

[Printed, 4*d*. No Drawings.]

A.D. 1864, April 26.—N° 1050.

RUSSELL, James, junior.—(*Letters Patent void for want of Final Specification.*)—Coal cutting, &c. machine.

" The cutting apparatus consists of tooth-shaped removable " cutters carried on the edge of a flat disc, or of a set of radial " arms, which move with a continuous revolving motion in the " plane of the groove about an upright or nearly upright axis, " which is supported in a suitable frame or carriage outside " the groove." The cutters may be all of one size and shape, or they may be alternately larger and smaller, or they may be in sets of three or more of progressively increasing dimensions, so that the foremost cut a small groove, and the next enlarges that groove, and so on. The machine is claimed to be more efficacious in removing the debris of the cutters from the groove than the pick machines.

[Printed, 4*d.* No Drawings.]

A.D. 1864, May 17.—N° 1244.

HUNTER, George.—Machinery "for cutting marble, stone, slate, and coal."

The invention consists in forming tools for cutting the above materials "of a solid bar with an enlarged or trumpet mouth, "and that dished or concave on its face;" sometimes the mouth is made "horse-shoe shaped."

For boring tunnels, these tools are mounted on the end of a cylinder, or the segments of a cylinder, which segments are supported on a face plate, and are capable of being moved in or out radially, to suit the size of the boring. "A screw "or angular groove" is "on the outside, for the purpose of "leading out the debris," a leather packing to fit the cut of the tools may be used. The cylinder is mounted on a carriage, and driven in any convenient manner.

[Printed, 8*d.* Drawing.]

A.D. 1864, May 31.—N° 1352.

FIRTH, William, and FIRTH, Samuel.—Coal cutting, &c. machinery.

The invention consists in the following improvements:—A new form of pick, having more than one blade on the same face of the stem, so as to cut the coal at two or more points at each stroke.

Steadying the carriage by the use of sledges lowered in front of the wheels on to the rails, or by small horizontal wheels, carried by brackets, and running on the sides of the rails, or grasping a centre rail, which may be toothed at steep places, or by a roller supported by brackets in front of the carriage, by which it is preserved from tipping.

Fitting a spring buffer to the carriage, to be acted upon by the pick or balance weight on the return stroke, the piston thereby being relieved from the blow. This arrangement is claimed to accelerate the change from the back to the outward stroke, and to give increased velocity to the pick.

Connecting all the wheels of the carriage by connecting rods or otherwise, so that when motion is given to the machine it shall be communicated simultaneously to all the wheels.

[Printed, 10*d*. Drawing.]

A.D. 1864, June 1.—N^o 1354.

ECKERSLEY, THOMAS.—(*Provisional protection only.*)—Signalling in mines.

The apparatus consists of "a lever to which is attached an " index marked with figures, letters, or other symbols; such " as dots or strokes; the said index slides in a groove or case " so arranged as to cover the symbols as desired. The lever " also works in a slot containing notches for the said lever to " catch into, and a spring is fixed upon the lever to prevent it " catching in the notches," unless desired. "a hammer head " is also fixed on the lever, so that it may be used as a knocker " in the usual manner." This apparatus is connected with a similar apparatus at the top of the shaft by a wire. "When the " hooker-on at the bottom of the pit wishes to give any desired " signal, he pulls the lever so as to show the symbol agreed " upon for the purpose, which is visible at all the places, " having indexes at one and the same time. After or before " showing the desired symbol, the lever may be pulled so as " to knock and call attention, and the symbol can be again " placed as desired."

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 8.—N^o 1423.

BRAGG, ASTON, and BRIDGEMAN, GEORGE WILLIAM.—(*Provisional protection only.*)—Raising in mines and sewers, &c.

The inventors propose to use screws for this purpose, which screws are made in lengths, at one end with a socket, at the other with a plug. The plug end of one length is inserted in the socket of the other, and united by bolts or otherwise. In this way screws of any length may be made.

They may be used in "the shafts of mines and the various levels therein, for communicating motion to the buckets or "'kibbles' for conveying the ore up to the main shaft."

Also "for the conveyance of earth and rubbish from place to "place in making tunnels, sewers," &c.

[Printed, 4*d*. No Drawings.]

A.D. 1864, June 14.—Nº 1472.

TREGAY, William.—Boring rocks.

A tool of iron or steel is fitted to a spindle rotating in a frame. This frame is supported by a racked standard, upon which it may be elevated or depressed as required. A screw, bearing against the end of the spindle by means of a centre point to diminish friction, supplies the feed. Down the centre of the boring tool there is a channel through which water or acid may be forced to help the boring operation. The liquid is discharged at the point of the tool. It is admitted from a closed reservoir surrounding the top of the spindle, which has a channel in continuation of the channel of the tool. The fluid is forced into the reservoir by a pump. In addition to the introduction of the fluid, emery or other sharp powder may be used to facilitate the progress of the tool.

[Printed, 1*s*. Drawings.]

A.D. 1864, June 16.—Nº 1493.

THOMSON, Robert William.—Dividing "rock, stone, or "coal."

To effect this operation, the inventor places in the drill holes, water-tight vessels made of lead, copper, or some more elastic substance, as gutta percha, &c. These vessels are preferably of a flat form and are disposed in the plane of the intended division. They are packed with sand and connected by tubing, preferably of solid drawn copper, with a pump, such as is used for hydraulic presses. The expansion of the vessels under the pressure of the water effects the division.

[Printed, 8*d*. Drawing.]

A.D. 1864, June 16.—Nº 1500.

JONES, James Grafton.—Power for mining machinery.

This invention consists in causing a current of water to descend into the mine and there to actuate a hydraulic cylinder, to the piston rod or ram of which is attached the piston of an air cylinder. This cylinder is placed in a water tank kept supplied from the air vessel of the hydraulic cylinder, and short rods passing through its covers work the four-way cocks which form the valves of the hydraulic cylinder. The air is compressed into a suitable receiver and used to work the coal-cutting or other machinery, the water being pumped to the surface after it has done its work.

The machinery is susceptible of modification.

[Printed, 10*d*. Drawing.]

A.D. 1864, July 1.—N° 1638.

DANCHELL, Frederick Ludewig Hahn.—" Certain im-
" provements in apparatus by means of which air, gas, or
" vapour is to be removed from tubes, pipes, tunnels, pans,
" retorts, or other vessels."

The principle embodied in this invention is that of the ordinary injector. A jet of steam is blown into the pipe leading from the place to be exhausted and by its inducing action the air is drawn off with it.

[Printed, 6*d*. Drawing.]

A.D. 1864, July 8.—N° 1694.

EHRHARDT, Louis Henry Gustavus.—(*Provisional protection only.*)—Gunpowder for blasting.

" The following is an example of the mode of manufacturing
" gunpowder according to this invention :—Take about equal
" parts of tannic gallic acid or resin and chlorate or nitrate
" of potash finely powdered ; these ingredients when mixed
" together form a highly explosive compound, but taken
" separately are perfectly inexplosive and harmless. The
" above mixture will be found well adapted for blasting
" purposes."

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 8.—N° 1701.

ROGERS, Abraham.—Ventilating mines.

The inventor places one or more coke ovens as near as convenient "to the top of the foul air or ventilating shaft," and connects each oven by a flue with the top of the shaft, which is kept covered. "The flue from the shaft passes over the " coke oven (with apertures opening to the burning fuel), " thence passing along to the chimney, the heat of the oven " producing a current and consequently a draught on the " mine; or the flue from the ventilating shafts may enter the " oven near the feeding end thereof, when the ordinary flue " from the oven to the chimney will produce the draught " required. It will also be evident that coke ovens may be " applied for ventilating mines by placing them at the bottom " of the shafts if desirable."

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 13.—N° 1753.

MAITLAND, Pelham.—(*Provisional protection only.*)—Boring apparatus.

This apparatus, which is intended for use in "boring deep " and narrow holes as in forming artesian wells," consists of a tool carried at the end of a tubular rod made up of lengths of pipe. A bucket is placed in this hollow rod and is capable of being raised and lowered in it by a rod or chain or cord. The bucket is fitted at the bottom with valves opening inwards and is surrounded by packing to prevent the debris passing it. It is held in the hollow tube, during the boring operation, by spring catches or a bayonet fastening. The debris of the boring passes into the buckets, and in order to indicate when the bucket is full, another set of valves opening outwards may be fitted to the top of the buckets, which when opening, press a detent and release a hammer which fires a detonating signal. When full the bucket is withdrawn to be emptied.

[Printed, 4*d*. No Drawings.]

A.D. 1864, July 18.—N° 1797.

WESTMACOTT, Percy Graham Buchanan. — Machinery " for driving galleries, tunnels, and other works in stone or " mineral."

"In this machinery, cutters or tools, and hammers are used, " and the cutters or tools are set and held up to the work to " receive the blows of the hammers actuated by the mechanism. " The arrangement of the mechanism is such that after each " time a cutter or tool has been struck by a hammer, and the

" hammer has been caused to recede, the cutter or tool is
" slightly moved from the surface of the work to enable it to
" be reset by the machinery for the next blow of the hammer,
" and the tool or cutter is always kept steadily against the
" surface to be next cut before striking the blow. The
" cutter or tool is also made the means of following up and
" adjusting itself and the machine to the advancement of the
" cut."

[Printed, 2*s.* 2*d.* Drawings.]

A.D. 1864, July 20.—N° 1813.

NEWTON, William Edward. — (*A communication from Alfred Nobel.*) — Nitro-glycerine and analogous bodies for blasting.

The inventor claims the use of the above substances in place of gunpowder for blasting, the ignition being effected by the elevation of temperature produced by an electric wire or by an initiative explosion or detonation produced in various ways, such as by a percussion cap or a small quantity of gunpowder.

To prepare the nitro-glycerine, nitric acid is added slowly to a quantity of glycerine so that the temperature of the mixture is not much raised. The acid is prepared by treating nitrate of soda or potash with sulphuric acid, by which process, if the proportion of sulphuric acid be properly adjusted, a monohydrated nitric acid will result. Another and quicker method consists in preparing a mixture of sulphuric and nitric acids and adding thereto at once, a quantity of glycerine. The whole is quickly stirred and thrown into cold water.

To utilise all the nitric acid and to obviate combination of sulphuric acid and glycerine, phosphoric acid may be used instead of the sulphuric acid. In this case the glycerine combines with the whole of the nitric acid present, and the nitroglycerine being separated from the phosphoric acid solution, the phosphoric acid may be de-hydrated and used again, or after the mixture of sulphuric and nitric acids has been sufficiently heated with glycerine it may be submitted to cold to crystallize out the last traces of the nitro-glycerine and then be distilled to regain the sulphuric acid. Nitro-glycerine may may be mixed with such substances as nitro muriate or nitrate of urea.

[Printed, 4*d.* No Drawings.]

A.D. 1864, July 30.—N° 1904.

BEAUMONT, Frederick Edward Blacket.—Tunnelling machinery.

The machine in question consists of an iron disc carrying a number of wheels or jumpers round its periphery. The disc is caused to move to and from the face of the rock by steam or water power. The chisels cut "a continuous chase or groove "by causing them each to take short steps forward in the "intervals between the blows." To the centre of the disc is attached a single chisel which drives a hole in the centre of the portion surrounded by the chase or groove cut by the other chisels. This central hole serves for the blast which breaks up the isolated portion of rock.

[Printed, 2*s.* 4*d.* Drawings.]

A.D. 1864, August 12.—N° 2007.

ALISON, Alexander, and **SHAW**, John.—Raising and ventilating.

In the shaft is placed an iron tube about five feet in diameter. In it works a piston, forming also the cage or receptacle for the minerals or men to be raised or lowered. An engine at the top of the shaft pumps air into a receiver, which air is then led down the shafts to the foot of the vertical pipe. Here it is allowed to pass into the pipe under the piston and so to raise it to the surface. When the piston is to descend the air supply is cut off and a relief valve opened. The air forced out through the relief valve, by the weight of the descending piston is conducted by pipes to the workings of the mine, to assist ventilation. Doors may be placed at the different levels in the pipe and the cages are filled by inclined shoots at the several levels.

[Printed, 8*d.* Drawing.]

A.D. 1864, August 22.—N° 2068.

FEICHTINGER, Franz.—Preventing damp in dwelling houses, tunnels, &c.

This invention consists in preventing the passage of damp through walls and other erections, by cementing plates of glass as a lining, against the wall. The Specification states that the invention is applicable to "tunnels, bridges," &c.

[Printed, 4*d.* No Drawings.]

A.D. 1864, August 25.—N° 2100.

BROOMAN, Richard Archibald.—(*A communication from Alphonse Dumas.*) — Firing blasting charges and electric illumination in mines.

This invention relates to a former one by Alphonse Dumas, for which Letters Patent were granted to W. E. Gedge in 1862 (No. 1043), but the Specification of which does not come within the scope of this series of abridgments.

The apparatus is contained in a portable case. It consists of a single cylindrical element of a battery with two concentric compartments, containing respectively a zinc cylinder and a platinum or carbon plate, the inner compartment being porous. The cell is composed of caoutchouc and is watertight. A stud brings the battery into action when required. An induction coil is placed also in the portable case and there is also a vacuum tube by which a light may be given in the mine to the workmen. Connections are provided by means of which the tube or the charge may be put into electrical communication with the apparatus either by an induced or a primary current. Several batteries may be united, and relay instruments may be used.

The blasting "primings are composed of a very fine pla-
" tinum wire, without twist, uniting the ends of the principal
" wires. The distance between the ends of the wires is about
" a quarter of an inch. The wire is surrounded by fulmi-
" cotton powdered over with fulminate of mercury. Priming thus prepared is enclosed in a gutta percha pouch filled with
" gunpowder.

[Printed, 8*d*. Drawing.]

A.D. 1864, August 29.—N° 2121.

ARMITAGE, Frederic William.—Coal cutting, &c. machinery.

The characteristics of this machine are that the tool instead of being reciprocatory is continuously rotary, and that the sole plate is constructed in two halves, for the sake of portability, and also, because of its length, to afford a fulcrum or support at each end outside the circle in which the picks or cutters revolve.

These halves are each fitted with four wheels, but when they are bolted together the inner wheels are removed, so that the complete foundation plate rests on four wheels only, one at each corner. The picks are carried horizontally under the plate, and the engine for working them, is placed diagonally on one of the halves of the plate. In this way the centre of revolution of the picks is brought near the face of the works, and is about midway between the extremities of the foundation plate.

[Printed, 8*d*. Drawing.]

A.D. 1864, September 2.—N° 2162.

BURDON, William Wharton.—Coal cutting machinery.

This invention consists, firstly, in the use of a compressed air or steam cylinder, mounted on a carriage, so as to be raised or depressed as desired, the piston rod of which acts as a hammer upon a pick or jemmy held in the hand of the workman.

It consists, secondly, in the use of circular saws arranged in groups of various sizes on a shaft rotated by power, the whole being mounted on a carriage automatically progressed. Rollers on the side of the machine bear against the face of the coal and " prevent the machine becoming set; they also enable the " breadth of cut to be regulated."

[Printed, 8*d*. Drawing.]

A.D. 1864, September 9.—N° 2207.

BARLOW, Peter William.—" Improvements in constructing " and working railways, and in constructing tunnels."

In constructing tunnels "a cylinder of somewhat larger in- " ternal diameter than the external diameter of the intended " tunnel is employed. The forward edge of this cylinder is " made comparatively thin; within this cylinder and near the " forward end thereof are upright plates parallel to each other, " also formed with cutting forward edges, in order to cut " freely through the soil in front when the cylinder is forced " forward. The earth is continuously removed from within " the cylinder, and the cylinder is from time to time forced " forward a short distance, to admit of a ring of iron being " put together within the inner end of the cylinder, such iron " ring being of a strength suitable for forming a permanent " lining to the tunnel."

[Printed, 10*d*. Drawing.]

A.D. 1864, September 16.—N° 2258.

HEY, Joe Green.—Lubricating the axles of curves.

"To the outer face of each wheel of the corf or carriage " is cast a dome-shaped cup or receptacle for oil, forming one " half of the boss, in which the axle works. On the inner " face of each wheel is a similar domed shaped cup or recep- " tacle (secured thereto by bolts or other suitable means), " having a flap or projection cast thereon, through which is " a pipe placed at an angle and reaching to the under side " of the axle, a hole being bored vertically in the flap or " projection and communicating with the above-mentioned " pipe for the purpose of supplying the dome-shaped cups or " receptacles with oil, a second pipe serving as an overflow or " gauge to regulate the quantity of oil supplied; the dome- " shaped cups or receptacles enclose a boss in which the axle " works, one or more holes being bored through the boss; " oil flowing through the hole or holes will lubricate the axle. " In discharging coal or other matter the curves or carriages " are frequently inverted, the oil receptacles above described " being also inverted will effectually lubricate the axles " without the waste consequent upon the plan or method of " lubricating by hand."

[Printed, 10*d*. Drawing.]

A.D. 1864, September 19.—N° 2293.

TAYLORSON, Thomas.—(*Provisional protection only.*)—Valve gear for coal cutting, &c. machine.

The object of this invention is to render the apparatus "self- " acting in reversing the valves at any part of the stroke, " according to the depth of cut." An ordinary governor is connected with the cutting instrument in such a manner "that " in the forward action or stroke of the pick rotary motion is " given thereby to the governor, causing the balls or vanes to " expand; and immediately on the delivery of the stroke or " blow of the pick the rotation of the governor ceases, when " the balls or vanes collapse and operate a catch lever which " actuates a suitable arrangement of levers and weight to " reverse the valves for another stroke and so on."

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 10.—N° 2492.

WEBSTER, JAMES.—Flat chains for mines, &c.

These chains are made "by interlacing or screwing together
" separate lengths of coiled metal rods or wires. "Each of
" these metal rods or wires is first formed into an open twist
" or coil of any desirable length and thickness. Two of these
" coils are then screwed or interlaced together, coil within coil,
" and any additional number of coiled rods or wires is
" similarly interlaced until the length or area of the chain is
" formed."

[Printed, 8*d*. Drawing.]

A.D. 1864, October 17.—N° 2566.

NEWTON, WILLIAM EDWARD.—(*A communication from Thomas Hunter Walton.*)—(*Provisional protection only.*)—Safety fuses for mining.

A narrow groove is ploughed in a strip of wood, and a train of powder or gun cotton placed therein. The groove is closed by waterproof material, such as oakum, tarred cord, pitch, &c. One end of the fuse is fitted to the cartridge, the other is furnished with slow match.

[Printed, 4*d*. No Drawings.]

A.D. 1864, October 20.—N° 2593.

SHAW, JOHN.—Coffer dams, &c.

This invention is described as applied to the sinking of a caisson for making foundations under water. To the top of the caisson is fitted what the inventor terms a condenser. It consists of an air-tight chamber, into which air may be compressed by a pump. The compressed air forces the water out of the caisson and enables the workmen to excavate inside it. The sides of the condenser project over the caisson and a hopper is fitted in the projecting part, through which the materials excavated from the caisson are ejected into a boat or elsewhere. The hopper is valved at top and bottom. When it is full the top valve is closed and the bottom opened to allow the materials to fall out. Adjoining the hopper and communicating with it is a cistern, into which water runs from the materials excavated. When the materials have been ejected from the hopper the bottom valve is shut and water from the cistern allowed to flow into the hopper till the pressure therein is equal to that of the air in the condenser. Then the top valve can be opened and in filling the hopper again the water will run back to the cistern. The hopper may also communicate by means of a pipe with the bottom of the caisson so that, the top valve of the hopper being closed and the bottom valve opened, water may be forced up from the caisson and ejected through the hopper.

The inventor claims that his improvements "may not only " be used for forming foundations under water, but also in " mining operations, for passing through quicksands and wet " places."

[Printed, 10*d*. Drawing.]

A.D. 1864, October 21.—N° 2612.

DONISTHORPE, George Edmund.—Securing rail or tramways for coal-cutting machines.

The object of this invention is to obviate displacement of the rails by reason of the lateral thrust of the machine. The sleepers upon which the rails are laid, are supported at the ends farthest from the work, by vertical props standing in suitable shoes and secured by being screwed against the roof of the working. These props are formed of parallel metal plates between which the sleepers are placed and secured by pins. As the coal is removed the rails require to be moved further from the props and to do this the sleepers are slid through the props and pins inserted in other holes. The ends of the sleepers nearest the face of the coal are supported on wood blocks or bearers. The rails are secured in notches in the sleepers, one of them being toothed for the progression of the machine.

[Printed, 10*d*. Drawing.]

A.D. 1864, October 21.—N° 2613.

JONES, James Grafton.—Machinery for getting coal, &c.

This specification recites that in coal cutting machinery there is a tendency "to swerve and vibrate on the rails to the " prejudice of the way," and proceeds to point out that the invention consists "in the application of a rolling weight or " roller at the hinder part of the carriage. This roller or " weight runs on the rails, and is formed with flanges to keep

" it correctly on the rails. The roller or rolling weight is " connected with the under part of the carriage by a bar in a " central position between the rails of the way on which the " carriage runs. This bar is made in two parts in order that " its length and the distance of the roller from the front of " the carriage may be adjusted. The fore end of this bar is " securely and rigidly fixed by screw bolts and nuts to the " under part of the carriage. The axis of the roller turns in a " single bearing which is equi-distant from the two ends of the " roller."

[Printed, 8*d*. Drawing.]

A.D. 1864, November 11.—N° 2816.

SUTHERLAND, Horatio, and SUTHERLAND, Edward.—Compressing powder for blasting, and blasting cartridges.

For the former purpose the powder is placed in a cylinder or mould, provided with a core. This mould is then placed in the ram of a hydraulic press and forced upwards against a fixed plunger, perforated axially to receive the core of the mould. When the powder is sufficiently compressed, the pressure is stopped, the bottom of the mould removed and the pressure again applied, by which operation the compressed charge is forced out of the mould. The hole left by the core is for the insertion of the fuse.

The improvements in cartridges have reference to the Patent granted to Douglas Symonds Sutherland, in 1863, (No. 2251.)

The cartridges are made to contain above the charge a cone of wood. The cone serves to convey the pressure of the ignited gases uniformly to the sand tamping. When, in consequence of the position of the drift, there may be a difficulty in tamping the charge, the cartridge is contrived so as to dispense with the necessity for separate tamping. It is made up with a cylinder of wood divided diagonally, and having sand between it and the charge. The divided cylinder acts as a pair of wedges. Instead of sand an expending wad may be used.

[Printed, 8*d*. Drawing.]

A.D, 1864, November 22.—N° 2914.

GAY, Paulin Etienne.—" Cutting and excavating stone."

In this machine the cutting is effected by "a series of discs " with cutting or biting edges arranged according to the outline "or profile of the mass of rock or stone to be excavated." "The cutting or biting discs receive a rapid rotary motion from "any convenient power; they are formed of rigid or malleable "metal, and act by their circumferential face or periphery, "upon which a biting material and water are poured." The discs may also be made of various materials, "such as cement, "lime, or limestone, and other substances agglomerated so as "to form a kind of millstone." "Hollow tubes" also act as borers in making holes to receive charges of powder, which, by their explosion, detach the portions of rock already cut out by the discs. By suitable mechanism the machine can be advanced and retired to and from the rock.

[Printed, 10*d*. Drawing.]

A.D. 1864, November 23.—N° 2929.

HAGGIE, Peter, and GLEDHILL, Peter.—Coal cutting, &c. machinery.

The chief feature in this machine is that it is supported on a carriage having but one wheel on the side near the face operated upon, and two wheels on the other side. Two wheels placed close together may indeed be used in place of the one wheel, but this arrangement is not advocated. Various forms of engine may be used. The pick axis may be actuated by a piston working in a segmental chamber or cylinder, a section of a hollow ring in fact. The piston is attached to a disc which works through a stuffing box formed in the side of the cylinder. Or the engine may have a cylinder with a central passage through it and an annular piston, giving motion to a cross head to which a connecting rod is attached. Or the annular piston may be fixed and the cylinder moveable, the connecting rod being attached to the cylinder and working through the central passage. Again, a "pendulous" engine may be employed, the cylinder being mounted on an axis at one end. In other cases the cylinder being made to slide on a fixed piston rod and by a rack on the cylinder give reciprocating motion to a pick shaft; or the cylinder may be fixed, and the piston rod bear a rack.

A wheel is described which grasps the rail somewhat after the manner of a clip drum.

[Printed, 1*s*. 8*d*. Drawings.]

A.D. 1864, November 28.—N° 2962.

GARRETT, William Elliott, WARRINGTON, John, and STURGEON, John.—"Cutting coal, stone, &c."

In the machine described in this specification the picks have "a self-acting compound vibratory motion." The pick strikes its blow and is then drawn towards the machine to loosen the mass. This last motion "it has been usual to impart by "manual power." A separate "under carriage or truck" is dispensed with by the cylinder being fitted with "skids or "wheels" and the axis of the pick being mounted on the cylinder. A "plate or bar or other suitable contrivance" is connected to the axis, so that "the pick being capable of being "suitably attached to any part along the same may thus be "set so as to work at any point within the length of such plate "or bar. A bar or guide, provided at each end with suitable "contrivances for securing the same between the roof and "floor" is added, so that "the machine shall be effectually "held down upon the rails or trams on which it runs."

[Printed, 10*d*. Drawing.]

A.D. 1864, December 24.—N° 3208.

TAYLOR, Charles Henry.—Safety cages.

Parallel toothed guides are placed in the shaft, between which the cage rises and falls. To the top of the cage are fitted toothed pinions which take into the racks and revolve as the cage ascends and descends. When the rope breaks in ascending, a portion of the apparatus to which it is attached, is released and arrests the rotation of the pinions, either by pawls or by teeth, so that the cage is suspended in the racks. In descending the speed of descent may be checked by means of brakes on the axes of the pinions. Means are provided of throwing the apparatus in and out of gear.

[Printed, 8*d*. Drawing.]

A.D. 1864, December 29.—N° 3230.

EDWARDS, George.—Raising minerals, &c.

A piston is made to fit the shaft and is furnished with means for supporting minerals, water, &c. For the descent of this piston in the shaft, the top or bottom of the shaft is closed and the speed regulated by valves in the piston or in the shaft. For the ascent, "the atmospheric air is used by rarifying the "air above the piston, or compressed air is used below the "piston. At the top and bottom of the shaft is an air-tight "space in which the piston, on arriving, compresses the air "and stops itself, and the space at the bottom serves also as a "well for collecting water from which the buckets of the "piston take it." The piston is packed by means of fibrous material arranged in the form of a brush, or by a pad of some such substance, which is kept pressed against the sides of the shaft by the pressure of the air in the shaft.

The pump, which the inventor prefers to use for compressing and exhausting, "is of a hollow, spiral, or screw shape "placed in a vessel divided into two compartments by a "partition through which the screw or spiral passes. This "vessel contains water or other liquid which enters the lower "portion of the screw or spiral when made to revolve, and "pushes the air from one compartment to the other."

[Printed, 10*d*. Drawing.]

1865.

A.D. 1865, January 11.—N° 96.

JONES, James Grafton.—Coal cutting, &c., and air compressing machinery.

For compressing the air used in working machines of this class, the patentee connects the piston of the air cylinder with that of the steam cylinder, placing the two cylinders only sufficiently apart to afford access to the stuffing boxes. The valves are worked by tappets by means of rods passing through the cylinder covers and struck or thrust by the pistons. There is no fly wheel or shaft.

When the machines are at some distance from the air pump, air vessels are placed at intervals along the main.

The coal cutting machines are contrived to cut the coal outwards, from the back to the front, and not from the face to the back as usual. "By this means lever picks will be less liable "to be held in the workings than heretofore." A cut is first made by hand to enable the tool to start. A shield is fitted to the apparatus to protect it and the workmen from the fragments of coal hewn off.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, January 16.—N° 136.

COTTER, John Berkeley.—(*Provisional protection only.*) —Powder for mining purposes.

This invention relates chiefly to the construction of shells and fuses, but it also comprises a powder which "may be "applied to mining and blasting purposes as a substitute for "gunpowder. This powder is not injured by damp, and "change of climate will not alter its qualities, and the in-"gredients when separate are not explosive." It is composed of chlorate of potash and realgar in about equal parts. It is of great explosive strength.

[Printed, 4*d*. No Drawings.]

A.D. 1865, January 30.—N° 262.

GIBSON, John.—Relieving strain on winding ropes.

For this purpose laminated springs are placed under the bearings of the pulley, "and so as to be capable of working "within metal boxes secured to the ordinary frame for sup-"porting the pulley." The spring rests "at each end on "rollers (preferred to be of cast steel) in order to prevent the "friction of the spring when working." "The springs also "rest on cushions of india rubber confined within metal guides, "the upper edges of which are curved to correspond with the "concave form of the bottom plate of the spring, and the "cushion is of sufficient depth to extend above the top of "the guide plates, so as to leave a space for deflection between "the bottom plate of the spring, and the top of the guide "plates, such space being filled with india-rubber. And there "are compensating volute springs fixed in the centre under "the laminated springs for the purpose of restoring the latter "to their position on the removal of the downward pressure "on them."

[Printed, 10*d*. Drawing.]

A.D. 1865, February 11.—N° 392.

WEST, Charles.—(*Provisional protection only.*)—Alarum for mines.

This alarum is intended to give notice of any sudden eruption of water into the mine. "The apparatus is somewhat
" similar to a miniature drawbridge; it has two buttresses
" made of wood, on each of which there is a small surface of
" metal, to which the connecting wires are fixed, one to either
" buttress. The bridge is fastened to one of the buttresses
" by hinges; it is of wood, but has a small metallic band,
" which when raised to its level brings the two wires into
" contact. One end only is fastened; the other is allowed to
" fall down, but is immediately raised upon any sudden
" eruption of water, when contact is made, and the alarm
" given."

[Printed, 4*d*. No Drawings.]

A.D. 1865, February 28.—N° 558.

LAUDER, George. — (*A communication from William Watson Grier and Roberts H. Boyd.*)—Coal-cutting, &c. machinery.

A number of augers or drills are mounted horizontally in a frame, and are driven by toothed gearing. The frame is supported upon a carriage and is so arranged as to be capable of being fed forward and drawn back as the necessities of the work may require. The withdrawal may be effected more rapidly than the feed. The drill points are triangular in shape with edges slightly curved and serrated. The carriage is borne on four flanged wheels, each of which is fitted to a cylindrical swivel bearing attached to the carriage. By means of chains worked by a lever, the whole of these wheels may be turned at the same time, and so, with the help of turntables, move on to another set of rails. By this method of working the apparatus may by degrees, be moved along the face of the coal to be detached, and when a horizontal groove is completed, a similar set of drills supported in a vertical frame, cut vertical grooves and so mark out a block to be subsequently forced down.

[Printed, 8*d*. Drawing.]

A.D. 1865, March 9.—N° 668.

ANSELL, George Frederick.—Ascertaining the presence of explosive gases in mines.

The inventor avails himself of the endosmose action of the gas. One form of his apparatus consists of an india-rubber ball or bladder inflated with air and provided with an alarum. When this ball is surrounded by carburetted hydrogen, the gas will enter the ball and by expanding it, set at liberty the alarum. Electric apparatus may be added, if desired, in order that information of the presence of the gas may be conveyed to a distance. In another form of instrument there is substituted for the ball, a porous jar, closed by a flexible diaphragm, through which passes a bent tube containing mercury on which floats an index. The entrance of the gas into the cell effects an alteration of level in the tube and a consequent indication.

The apparatus may be arranged to indicate quantitively the presence of the gas; and a portable modification of the aneroid barometer is described, for the use of mine inspectors and others.

[Printed, 10*d*. Drawings.]

A.D. 1865, March 16.—N° 737.

FARRAR, James, and BOOTH, Edwin.—Coal-cutting, &c. machinery.

The machine is mounted on a carriage, which runs on rails parallel with the coal face. It is propelled thereon by means of a chain coiled round a barrel and secured at each end of the working. A piston working in an air cylinder turns, by means of a ratchet wheel, the barrel sufficiently at each stroke of the machine, to bring the tool to a fresh spot. The tool itself is secured at the end of a piston rod, worked to and fro by compressed air or other elastic fluid. A spring is fitted to the rear of the piston to prevent the shock of the backward stroke. A vertical rod, working in a cylinder, and furnished at the top with rollers, covered with india-rubber, presses against the roof to steady the machine. The tool may also be worked through cranks. This machine cuts a groove in the coal.

[Printed, 10*d*. Drawing.]

A.D. 1865, March 25.—N° 849.

BARNES, Richard William.—(*Provisional protection only.*) —Examining tunnels, drifts, sewers, &c.

This invention consists in the following:—

Firstly, an improved lantern formed with a double casing, the space between the two cases forming a chamber or passage for the supply of air to the lamp. This lantern may be sunk in water if necessary, and is fitted with a socket for the reception of a staff by means of which it is manipulated.

Secondly, a " reflecting apparatus, which consists of a " suitable framework provided with a similar " socket for the staff. In the framework, a reflector is mounted, and is " so " arranged as to be adjustable to any required angle upon its " own axis by means of a tangent screw or other suitable " means."

Thirdly, a staff, which, for the sake of portability, is jointed and may be folded up. This staff is graduated and may be used, if desired, as a levelling staff. It is fitted with pulleys and cords, by means of which the position of the lantern or reflector may be adjusted. By means of the above apparatus light may be thrown from the lantern, held by one staff, on to the reflector held by another staff and may thence be reflected in any required direction. By this means the state of the interior of sewers, excavations, etc., may be ascertained without having to descend into them.

[Printed, 4*d*. No Drawings.]

A.D. 1865, April 6.—N° 981.

JOHNSON, John Henry.—(*A communication from Herman Haupt.*)—Drilling and boring rocks, &c., and ventilating mines.

The chief feature of this invention lies in the fact that the drill is provided with a momentum feed as well as a positive rotary feed. By this contrivance the drill is caused to adjust its operations according to the nature of the rock upon which it acts. The drill bar is carried in a hollow piston rod which works through both ends of the cylinder, fitted with appropriate valve gear. The drill bar or tool holder is secured to the piston rod by means of a clutch apparatus, called a " gripper box," the object of which is to grasp the bar during its receding movement, but during part of the advance, and near the end of the stroke, to release it, thereby allowing of its self-adjustments in accordance with the penetrability of the rock. Rotary movement is imparted to the drill bar at each stroke by means of a stud operating in a helical slot in the casing of the "gripper box," or otherwise. It is also found desirable "to multiply the strokes of the tool" under full head "of steam between each advance or feed of the drill," and for this purpose the apparatus is arranged so that the bar is only released by the "gripper box" at intervals. Studs are provided which only engage at the pre-arranged intervals, at which times only the feed takes place; during the intermediate strokes, the drill is held by the gripper and is driven fully home by the steam. Means are provided for preventing return in the rotation of the tool. A solid piston rod may be used instead of the hollow rod if preferred, the "gripper box" being modified accordingly.

The apparatus is supported by trunnions on a framing made of iron pipes. These pipes, which serve to conduct the steam or air, are adjustable by screws working in thimbles.

To ventilate the working, a pipe is placed in it, which is exhausted by means of a fan, or air is forced in by the same means. The pipe may be of wood or other material. The steam generator is put into communication with the pipe, so that the smoke, exhaust steam, and vitiated air are all drawn through it. Branch pipes may be added to reach other galleries.

[Printed, 1*s*. Drawings.]

A.D. 1865, April 6.—N° 982.

JONES, James Grafton.—Valve gear for coal, &c. cutting machines.

This gear is intended to be used where the length of each stoke of the machine may vary by reason of interfering causes. "The piston rod is hollow, and has within it a rod" which passes through a stuffing box in the rear cylinder covers, and is attached to the lever or rocking shaft which works the valve. The other end of the rod has a disc or stop, and upon the rod slides freely a "tappet or instrument" which is preferably "a cylinder of lead lined or bushed with brass." Should the piston of the engine, by meeting a resisting substance, be arrested before it has completed its normal stroke, the momenturn of the tappet will carry it along the rod till it reaches the disc, and thus cause the rod itself to move and so reverse the valve.

[Printed, 8*d*. Drawing.]

A.D. 1865, April 28.—N° 1192.

BERNARD, JULIAN.—Blasting and boring tools.

This invention relates, firstly, to a cartridge so constructed as to be incapable of injury through vertical compression. The charge is placed in a cylindrical casing of requisite strength, which is provided with openings to allow the explosion to act freely. Or the charge may be placed round the stem or core of a protector shaped like a cotton reel, the electric discharging wire being inserted in the stem or core.

The invention also consists in forming the cutting edges of boring tools by means of dies, the tools and dies being brought into forcible contact in various ways. The tool may be held in a stationary position and the die pressed upon it, or vice versa.

The Provisional Specification further mentions another form of cartridge, consisting of a bar furnished with powder chambers, and also certain methods of tamping, all of which form the subject of a subsequent Patent, No. 2774, 1865.

[Printed, 10*d*. Drawing.]

A.D. 1865, April 29.—N° 1203.

LEATHAM, WILLIAM.—Coal cutting, &c., machinery.

The invention consists in the following improvements :—

Applying anchors, capable of holding themselves in the grooves during the action of the machine, "such anchors being "rendered self-acting by the action of the machine in being "fixed during each stroke of the pick," and being "loose "whilst the machine is being moved forward." The fixing and unfixing is performed by turning a shaft on its axis.

Attaching the pick in such a way that the point may be cleared in the back stroke. The point may also be made to expand by means of a wedge, when the blow is given. A clearer is also provided. The point of the pick is made separate for convenient removal and replacement.

Applying an additional cylinder in such a way that "one "piston will make two strokes while the other piston is making

" one stroke, and while the main cylinder piston makes one " stroke the pick will strike twice, and will commence to give " the blow at or about the centre of the stroke." The " additional cylinder, is so arranged as to compress air and thereby " form a retarding action on the main cylinder piston in the " back stroke of the pick, giving more time for the other " actions to take place in the movement of the machine." A compensating motion of other curves described by the radiating arms is provided. Suitable valve gear is described.

Constructing the framing so as to rise or fall in "slides by " means of screws, levers, or inclined planes," "and a second " frame forms the foundation for the fixings" of the machinery.

" Constructing the flange of one or more of the wheels with " ratchet teeth to be acted upon by levers, catches, or palls. " The machine when moved forward is sustained or held in " position by other catches taking into the said teeth. The " rim of the wheel or wheels is perforated to fit on conical " pins formed on the rails, thus causing a dead lock during " the cutting process. The rails are constructed of corrugated " iron plates, so as to form a portable frame of convenient " length, thus forming ties and sleepers to the rails."

Applying to the carriage a lever, one end of which carries a seat for the attendant, the other an anchor to bear against the roof, a cam relieves the pressure on the anchor when the machine has to be moved. The machine may be made to lay down its own tramway.

An air compressing apparatus, consisting of a vertical cylindrical air vessel, surrounded by pumps, the plungers of which are furnished with friction rollers, and are acted upon by cams attached to a revolving horizontal disc. The air chamber is fitted with a peculiarly designed diminishing valve.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1865, May 15.—N° 1343.

ELLIOT, George, and COXON, Samuel Bailey.—Diminishing strain on mine pulleys.

For this purpose the bearings of the pulley are supported upon the piston rods of steam or air cylinders. " The steam or " elastic fluid is introduced by means of pipes into a pair of " steam cylinders, placed at such angle of inclination as shall

" be most expedient, and of calculated area to overcome the " weight of (at least) the empty cage and tubs. The amount " of spring can be regulated by the length of cylinder, or by " applying rests upon the slides or motion bars." "Any " desired amount of pressure may be gained by throttling the " pipes conveying the steam to the cylinders."

Water may also be used, the pressure being afforded by an accumulator.

[Printed, 10*d*. Drawing.]

A.D. 1865, June 12.—N° 1587.

HASELTINE, GEORGE.—(*A communication from Thales Lindsley.*)—(*Provisional protection only.*)—Boring tunnels, &c.

"The object of this invention is the formation of tunnels and " other like excavations in rock, without the employment of " gunpowder." The machinery consists of apparatus for cutting annular grooves or recesses in the rock, combined with means for splitting up the masses so isolated. The annular grooves are cut by a number of cutters fitted in a revolving head or frame carried on a horizontal bar, the end of which fitted with a crow bar forming the ram for driving in wedges for splitting up the rock. As the revolving cutter works, by means of a pair of oscillating cylinders, screw feeding gear keeps the tool up the work. When the chisels have advanced sufficiently, by altering the feeding gear the tool is rapidly withdrawn. The wedges are then inserted and the ram driven against them by the pressure of a pair of horizontal cylinders. A separate chisel, placed behind the cutter head and set radially to the horizontal bar, is used for the purpose of cutting a channel or watercourse in the bottom of the tunnel. The framing is furnished with rollers to facilitate moving into position, and it is secured by wedging. The tunnel is ventilated by the air escaping from the cylinders.

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 17.—N° 1636.

KLEIN, AUGUST.—(*A communication from Gustav Adolph Neumeyer.*)—Powder for mining and other purposes.

This powder is claimed to be "comparatively harmless" " when ignited under any other conditions than those in which

" it is to be employed;" and further to evolve less of the " obnoxious vapours than are produced by the ignition of the " ordinary powder."

"About 75 parts by weight of saltpetre are mixed with about " 18·75 parts by weight of charcoal, and about 6·25 parts by " weight of flowers of sulphur, to form 100 parts of gun- " powder."

"The charcoal is by preference prepared in the following " manner:—Pieces of birchwood are first ignited, and are " then immediately placed in a receptacle, which is closed " hermetically. The charcoal thus obtained is soaked in soda- " lye, and is dried upon canvass strainers; it is then reduced " to a powder, and is mixed or incorporated in a moist state " with the other ingredients." "The mass thus produced " may then be treated in any known manner for converting it " into a granular, pulverulent, or solid form."

[Printed, 4*d*. No Drawings.]

A.D. 1865, June 21.—N° 1666.

GEDGE, William Edward.—(*A communication from Xavier Philippart.*)—" Raising loads from mines."

This apparatus, which is described under one of its applications as a fire escape, consists of a platform supported on a double series of lazy-tong levers, raised, that is extended, by toothed gearing. The apparatus is mounted on a carriage, but when fitted in mines it is placed "upon a fixed base."

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1865, July 5.—N° 1778.

LOW, George.—Boring rocks.

This invention relates chiefly to improvements upon the invention described in the Patentee's Specification of April 1863, (No. 903). The improvements consist—

Firstly, in advancing the tool by pressure instead of by gearing.

Secondly, in "the use of a cushion of air behind the boring " or cutting tool for the purpose of lessening the effects of the " blows of the boring tool, and preventing the shocks occa-

" sioned thereby from injuriously affecting the working parts " of the machine.

Thirdly, "in the turning motion, which is imparted to the " tool in the stationary cylinder, instead of to any of the " reciprocating or moveable parts."

And fourthly, in advancing the tool exactly in the same ratio as it cuts the hole, whether the rock be hard or soft.

A portion of the Specification is taken up by a description of a modification of the apparatus for coal getting.

[Printed, 3*s*. 4*d*. Drawings.]

A.D. 1865, August 2.—N° 1996.

McEWAN, James, and NEILSON, William.—Raising water from mines, quarries, &c.

This invention consists in raising the water in a continuous stream, through open pipes, without any obstruction in the way of valves, buckets, &c., by means of the "direct action of " a narrow or thin annular jet or hollow conical stream of " high pressure steam which is caused to pass through a " narrow annular slit or space made in the body of the pipe " at an angle, by preference of about 30° with the axis of the " pipe, but which may be efficiently varied 10° or 15°, more " or less, in an upward direction corresponding to that of the " jet or cone of steam desired to carry up the water in the " pipe thereby or along with it."

[Printed, 1*s*. Drawing.]

A.D. 1865, August 24.—N° 2178.

NEWTON, William Edward.—(*A communication from Hiram John Messenger, Stephen Brewer, and Byron Mudge.*)—"Well-sinking tubes."

This invention consists in making wells by driving into the ground an iron tube, having at its end a sharp conical-shaped drill or point to facilitate penetration. The lower part for some distance is perforated to allow of percolation of water into the tube. While sinking the tube the holes are protected by a shield or sleeve guard, in which the tube is afterwards capable of being turned round to uncover the holes.

[Printed, 6*d*. Drawing.]

A.D. 1865, September 2.—N° 2266.

REICHEN, CONSTANT.—Blasting charges.

These are made by rolling up paper saturated with a compositon made up of chlorate of potash 9 parts, nitrate of potash $4\frac{1}{2}$ parts, prussiate of potash $3\frac{1}{4}$ parts, charcoal powder $3\frac{1}{4}$ parts, starch $\frac{1}{21}$ part, chromate of potash $\frac{1}{16}$ part, and water 79 parts.

A solution of xyloidin in acetic acid is employed for waterproofing the paper cases.

[Printed, *4d.* No Drawings.]

A.D. 1865, September 15.—N° 2363.

NEWTON, ALFRED VINCENT.—(*A communication from George Jeffards Wardwell.*)—Quarrying machinery.

The machine is intended to quarry large blocks by cutting channels in the stone. The inventor arranges one or more groups of cutters in frames, which are capable of angular adjustment, and are supported on a carriage running on rails. The carriage is provided with shoes, which overlap the rails. The rails are toothed on their inner sides, to take into horizontal pinions, by means of which the machine is progressed. The engine is carried on a separate carriage and communicates power by a belt or connecting rod. The machine is fed automatically, and may cut while moving in either direction, and for this purpose the chisels or cutters are so arranged as not to require turning. The cutters are long strips of steel, the lower ends being chisel shaped and wider than their upper portions. They are secured together by clamps. In each group two cutters are placed, "whose edges are set obliquely to the "others, so that the elevations produced by the transverse "cuts may be removed." When the cutters are arranged to operate both ways, "the central chisel may have a pyramidal "point, and the concavity left by its blow will be reduced by "the succeeding transverse and diagonal cutting edge." The cutters are worked in the above-mentioned frames by means of "lever beams secured near their rear ends to rock shafts "mounted in bearings on the frame of the machine." They have springs beneath their rear ends, which move their forward ends downward with force. These levers are raised by cams, and work the cutters through strap or chain couplings. A windlass is added to the machine for the purpose of raising and sustaining the cutters when not in use.

[Printed, *1s.* Drawing.]

A.D. 1865, September 19.—N° 2383.

BROADBENT, JUBAL CHARLTON.—Safety cage.

On each side of the pit guides, and attached to the cage, is placed an eccentric, with its edge serrated to promote friction. Normally these eccentrics are held free from the guides by short chains, attached to the suspensory chain or rope. Should the latter break, the eccentrics fall into position to grip the guides, and if desired springs may be added to increase the rapidity of the movement.

[Printed, 10*d*. Drawing.]

A.D. 1865, September 25.—N° 2446.

BARNES, RICHARD WILLIAM.—(*Provisional protection only.*) —This invention consists in an application of reflectors to be used with a lamp or the solar light, in "examining sewers, "tunnels, &c." For levelling purposes a staff, described in the Specification, is to be used in conjunction with the lamp and reflector.

[Printed, 4*d*. No Drawings.]

A.D. 1865, October 16.—N° 2663.

MURRAY, CHARLES HENRY.—"Raising minerals, &c., from mines, wells, &c.

This invention relates to the construction of skips for the above purposes, in such a manner that the delivery of the contents of a skip will be self-acting. The bottom of the skip consists of doors or flaps, hinged to the sides of the skip and connected by their other edges with links or chains to a bar from which the skip is suspended, or to the suspending chain itself. When the skip is suspended the doors are necessarily held in a closed position, but directly the weight of the skip is taken off the suspending chain, by resting the skip on the mouth of a hopper or elsewhere, the doors open and allow the contents of the skip to escape.

[Printed, 10*d*. Drawing.]

A.D. 1865, October 27.—N° 2774.

BERNARD, JULIAN.—Boring tools and blasting.

The blasting charges are placed in annular recesses or grooves in an iron bar, through the axis of which is passed the means of ignition. This bar is inserted in the bore hole.

The inventor sometimes employs "a peculiar expanding collar " or ring on a part of the bar, which part" he makes "conical, " and which conical part is placed on or attached to a parallel " rod, but of smaller diameter than the outer portion of the " bar, and which" is made "hollow for receiving the smaller " rod. By this arrangement the outer portion of the bar can " be forced against the expanding ring and conical collar or " part of the bar, and in this way can be made to tighten the " bar and act as a tamping."

The inventor also places "over or against the tamping" " a moveable weight" suspended by a bar having stops or catches upon it.

The cutting edges of boring tools are formed with their serrations disposed "at different angles in different portions of " the same tool, so that a slight movement of the tool will " cause the serrations of one part of the tool to cut in a different direction on the rock to that of the teeth last previously acting thereon."

The invention further has reference to improvements in shaping the edges of chisels and tools, described in the Specification of the inventor's Patent, No. 1192, of 1865. The tool is first bevelled by forcing it into a V-shaped die or mould; it is then forced into a second such mould, the angle of which is less acute, so that the metal of the tool edge is highly compressed.

[Printed, 8*d*. Drawing.]

A.D. 1865, October 30.—N° 2796.

NEWTON, William Edward.—(*A communication from the Incorporated Washoe Tool Company.*)—Mining picks.

The eye of the pick is elliptical in section, and of equal size throughout its length. The arms or "bits" of the pick merge into the head by curved lines, instead of by an angular or shouldered junction. By this means vibration and fracture are obviated. The end of the helve is not split, wedged, or otherwise spread, but fits simply into the eye of the pick.

[Printed, 8*d*. Drawing.]

A.D. 1865, November 11.—N° 2900.

NORRIS, James.—Safety apparatus for difts, &c.

This invention relates to the mode of attaching the winding or balance weight rope or chain to the cage. Instead of attaching it to the top or roof of the cage, which method is always attended with danger to the cage in case of breakage of the rope or chain, in consequence of the broken part falling on to the cage, the inventor attaches the rope or chain to arms which project from the sides of the cage, such arms moving up and down in grooves or guides formed in the sides of the shaft. Friction rollers running on guides in the shaft, are fitted to the cage.

The drawing shows the improvement applied to the balance weight ropes of a hydraulic lift.

[Printed, 10*d*. Drawing.]

A.D. 1865, November 15.—N° 2940.

ALISON, ALEXANDER, and HOSKINGS, HENRY. — (*Provisional protection not allowed.*)—" Machinery for cutting " tunnels, &c."

In this machinery " there are two, three, or more discs with " chisels and a similar number of discs with inclined planes, " each chisel disc having an inclined plane disc opposite to it " of the same size, and the action of the chisels on the " inclined planes produces the percussion of the chisels " against the rock which cuts the tunnel."

[Printed, 4*d*. No Drawings.]

A.D. 1865, November 30.—N° 3074.

JOHNSON, JOHN HENRY.—(*A communication from James Suggett.*)—" Sinking and operating wells."

This invention consists in driving into the earth, or inserting in a hole previously bored, a pipe having a conical point, and perforated near its end to allow ingress of water. The pipe may be added to in lengths as desired. To prevent earth falling in through the orifices in the pipe, the interior may contain rags or old rope, which are to be removed when the pipe is in its place. Or the holes may be protected by a sleeve during the sinking, or by an internal sleeve or rod. A pump is fitted to the top of the pipe.

[Printed, 6*d*. Drawing.]

A.D. 1865, December 5.—N° 3127.

DONISTHORPE, GEORGE EDMUND.—**Progressing coal-cutting, &c. machines.**

For this purpose a screwed shaft working through a nut is employed. The shaft or nut may be carried by the machine as preferred. If the nut be carried by the machine, the shaft is attached to a pillar fitted on wheels which run on the same line of rails as the machine, and which pillar is screwed against the roof. When the carriage reaches the pillar, the latter is moved forward, and the operation repeated. If the screwed shaft is attached to the machine it works through a nut in the pillar. Two pillars may be used, one in front of the machine, and one behind, the machine working between them, and this arrangement is preferred when the nut is carried on the machine; the nuts being rotated. Pillars such as these may support a rail above the machine, against which a pulley may be pressed upwards from the machine, as described in the inventor's Specification, No. 1072 of 1863.

By a modification of the above system, the cutting machine is made "to slide on a bed that runs on the rails; the bed " carries a screw that works into a nut on the sliding portion " of the machine, and at one end of the screw is a hand wheel " by which the screw can be turned."

[Printed, 1*s.* 2*d.* Drawings.]

A.D. 1865, December 9.—N° 3173.

DOULL, ALEXANDER.—Constructing tunnels.

The tunnels or ways described in this Specification, are intended for use as railways upon the atmospheric principle.

The tunnel may be made of any suitable material, smoothly worked inside, but what is preferred, however, is a "cast-iron " invert imbedded in concrete cast in 5 feet lengths, the " several castings to be well joggled and bolted together." The castings are provided for the reception of friction rollers, upon which the train is propelled, and also with projections for the train guide wheels.

When partly or entirely above ground, the tube may be " composed of malleable iron ribs rolled into an H shape and " of sufficient strength to resist" pressure. The bars are bent to shape, strengthened with cross ties, and the spaces filled in with suitable material. An existing tunnel or cutting by this method, may be converted into two or more separate ways.

To form a tunnel under water, iron segments are used with an invert and key piece, the whole fastened together by dovetailed wedges of malleable iron or steel. The strengthening ribs are on the outside of all the castings. An air lock is used in the process of excavation to keep out the water. For moving excavated materials, the empty trucks are drawn back over the tops of the full trucks, the trucks carrying light rails for the purpose.

Modifications of the inventors' system of constructing tunnels for the purpose of using therein carriages running on a single rail, are described.

[Printed, 2*s*. Drawings.]

A.D. 1865, December 12.—N° 3206.

BUDENBERG, Arnold.—(*A communication from Bernhard August Schäffer and Christian Friedrich Budenberg.*)—Blasting powder.

This invention relates to an improvement upon the patentee's previous invention, No. 2555, A.D. 1863. It consists in making the blasting powder "by the combination alone of " potassio-tartrate of soda, with the nitrate of potash, the " sulphur, and the wood charcoal in certain proportions. The " matters being mixed together and granulated may be used " in cartridges or otherwise." The best proportions are given as 4 parts, 78 parts, 8 parts and 10 parts of the several substances respectively.

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 13.—N° 3218.

DŒRING, Frederick Bernard.—(*A communication from Carl Sachs.*)—Boring rocks, &c.

The drill, with which the work is done, is mounted on one end of a piston rod, the other end passing out at the rear end of the cylinder. The portion which passes out at the rear works, by means of tappets, the valves, and also two ratchet motions. One of these ratchet motions turns the piston rod and consequently the drill at each stroke, and the other motion serves to keep the machine up to the work.

[Printed, 2*s*. 4*d*. Drawings.]

A.D. 1865, December 20.—N° 3287.

HARRISON, Joseph John, and HARRISON, Edward.—(*Provisional protection only.*)—Purifying air of mines and sewers.

A receptacle is prepared in which charcoal or other disinfectant is placed upon shelves, through which air can freely pass. The air passes in through the bottom of the receptacle, and is caused to pass upwards and through it by means of the circulation produced by a burning lamp, a fan or other equivalent.

[Printed, 4*d*. No Drawings.]

A.D. 1865, December 20.—N° 3297.

COOKE, William Fothergill, and HUNTER, George.—Machinery for cutting slate, stone, coal, &c.

Two revolving cutters, consisting of cylinders, in the edges of which are fitted moveable teeth, are mounted on the ends of parallel shafts, and are caused to rotate in opposite directions. A boring bit may also work so as to cut a bore in the centre of the circular block cut by each cylindrical cutter, for blasting purposes. The cutters have also other teeth placed in rear of those on the edges, and which serve to open the groove cut by the former. The machinery is mounted upon a carriage, fed up to the work by winding a chain on a drum. The cutters shape two tunnels which nearly intersect each other. The portion between them is broken down as the work proceeds to allow passage for the machine. The wheels of the carriage run either at the bottom of these tunnels, or being bevelled are caused to leave a space between them and the bottom for the passage of water, &c. from the working. Steadying wheels pressed outwards by hydraulic pressure secure the machine. Scrapers are provided for facilitating removal of the debris.

Cutters may also be made to work one within the other, or instead of cutting out a block, to grind down the whole surface against which they work.

[Printed, 1*s*. 2*d*. Drawings.]

1866.

A.D. 1866, January 3.—N° 22.

BUCKLEY, William.—Signalling in mines.

This apparatus is for transmitting signals from the mine to the top of the shaft. "A metal base plate, which is secured "to" a suitable support, is provided "with two fixed studs or "centre pins, upon the first of which is fitted to play freely a "grooved pulley, round which the signalling cord or chain "passes, and whence it descends to the bottom of the mine "shaft. A stud or lateral projection on the boss of this pulley "works in a curved slot in the base plate, and thereby controls "the rotatory motion of such pulley. On one side of the "periphery of this pulley there is cast a pocket or recess, "which receives a tumbler for elevating" the hammer of a gong placed on the same stud with the grooved pulley. "The "second fixed stud serves as the fulcrum of the lever which "carries the hammer," and upon this stud there is also a perforated disc. "This disc receives a step and step rotatory "movement by means of a pall in the hammer lever taking "into a ratchet wheel on the centre of the disc, so that each "time the hammer is elevated by the action of the tumbler "against a projecting portion of its lever the disc will "be moved through a certain space." This movement of the disc displays numbers or other indications through the perforations.

[Printed, 8*d*. Drawing.]

A.D. 1866, January 8.—N° 58.

PENRICE, Herbert Newton.—Tunnelling.

For this purpose "a circular plate or frame with radial arms "or otherwise is employed, on the face of which are projecting "tools or cutters which are set in concentric circular rings or "otherwise, and it is sometimes preferred that when such "projecting tools or cutters are set in concentric circles that "the cutters or tools of some of the rings should project "beyond others, in order that they may produce circular "grooves in the face of the work, whilst other circles of the "tools or cutters break down the rings of rock intermediate "of the circular grooves. This frame or plate is made to "move to and fro a short distance at a high velocity, and such "plate or frame is caused to turn so that each tool or cutter "may be advanced slightly between the succeeding cuts."

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, January 11.—N° 94.

BARTHOLOMEW, Charles.—Breaking-down or detaching coal.

A hole is bored in the coal and a tube inserted, as described in the inventor's Specification, No. 90, A.D. 1864. This tube is smaller than the hole, but it has a conical end, in front of which are slots to allow for the projection of lewises from the interior. When the tube is inserted, a rod is passed in which forces the lewises outwards. The tube is then withdrawn, and this operation brings the cone against the lewises and forces them to take still better hold.

By another method pieces corresponding with the lewises above named are projected, and being furnished with cutting edges, they enlarge a space for themselves, upon the tube being rotated, and thus secure a good hold.

[Printed, 8*d*. Drawing.]

A.D. 1866, February 12.—N° 433.

COOKE, William Fothergill, and HUNTER, George.—Machinery for cutting stone, &c., forming tunnels, &c.

According to one method, a tunnel may be made by pulverizing the rock, cutting it away by means of drums carrying on their peripheries a number of cutters. These drums are supported on arms projecting in front of the carriage, and are driven by toothed pinions acting on racks on the interior of their peripheries. The feed is performed by means of a screw shaft working through a nut carried by and swivelling upon a fixed transverse anchor bar. If desired, the drums may be arranged so as to leave masses of rock between them, which are subsequently removed by cutters projected at right angles from the plane of the drums, but close to their periphery.

The cutters may be varied in form. "For stone, slate, or " rock it is preferred to employ a conical form, the cutting " edge being formed at the base or largest diameter of each " conical cutter, and the sockets for these cutters are fitted in " grooves in the surface of the disc or wheel." The cutters are described in a previous Specification, No. 1244, A.D. 1864.

For cutting straight grooves, an apparatus is described in which the cutters are fitted to a ring mounted on a disc of comparatively large diameter, such disc being supported by an arm or arms excentric to it. The ring is driven by a toothed pinion. This system is also applicable to machines for making a circular cut, so as partially to detach a portion of rock, which is afterwards broken down; and such a machine is described.

The patentees refer to previous Specifications, No. 1244, A.D. 1864, and No. 3297, A.D. 1865.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, February 15.—N° 477.

ROTHERY, Joseph.—Coal cutting machinery.

This invention consists, firstly, in an arrangement of machinery for the above purpose, in which the vibrating cutters are caused to strike the coal by means of a coiled or other conveniently shaped spring, which acts upon the cutter shaft or spindle. The return of the cutters is effected by cams or wipers on a cam shaft, such cams or wipers being actuated by a belt or by gearing, and made to operate upon tappets or short levers keyed on to the spindle of the cutter.

The invention also consists in the use or combination with the above machine, of an apparatus for utilizing horse power. The horse is caused to work with his feet upon an endless belt of bars of wood supported on links and friction rollers. This belt is carried by a framing on wheels, running on rails so that the horse may be moved with the cutting machine as the work progresses. The movement of the endless belt is communicated to the cutting machinery.

It is proposed to work air compressing or exhausting pumps by this horse-power apparatus, the compressed air or vacuum to be used for working coal cutting machinery.

[Printed, 1*s.* 4*d.* Drawings.]

A.D. 1866, February 23.—N° 557.

PARKER, James.—(*Provisional protection only.*)—Ventilating mines, and using foul air as fuel.

This invention relates to improvements upon the system of mixed air and steam engine described in the inventor's Specification, No. 2620, A.D. 1863, which Specification, however, is not abridged in this series. In that case, the engine was non-condensing; under the present improvements there is a condenser, having a partial vacuum, into which the mixed steam and air is discharged from the cylinder. The moisture condenses, and the air is drawn off by steam jets and nozzles. Vacuum pressure, obtained by this system, may alone be used as a motive power, or compressed air similarly obtained. "The "*boiler* and jets and nozzles may be placed at a distance of

" even several miles from the vacuum engine, with but very
" little loss of power, and therefore will be of great service for
" mining purposes, and also because the foul air or gas in the
" mine will thereby be drawn from the mine, and be replaced
" by a constant stream of fresh atmospheric air flowing into
" the mine."

"The foul air or gas drawn from the mine, if inflammable,
" will be discharged into the fire of the boiler outside the
" mine," to be used as fuel.

[Printed, 4*d.* No Drawings.]

A.D. 1866, March 3.—N° 655.

STEVENSON, James.—(*A communication from Theophilus Berrens.* — (*Provisional protection only.*) — "Perforating
" rocks." The object of this invention is "to increase the
" progress of the work in cutting through or excavating hard
" rocks by putting ten, fifteen, twenty, or more men to the
" work where no more than one or two can work together ac-
" cording to the method at present in use." The improved
apparatus "consists of a sheet iron cylinder of about four
" feet and one half in diameter and three feet in length,
" supported by a long round iron central bar or shaft,
" on which it is securely held by means of a strong cross
" piece; the sheet-iron cylinder is furnished at its outer end
" with several sets of boring tools of several shapes. The
" central shaft is carried over several grooved pulleys, over
" which it can slide; at its outer end it is fitted with a boring
" tool, while its opposite inner end has a toothed wheel keyed
" upon it, which gears into and is worked by an endless screw;
" besides, the central shaft runs in a bearing or bearings sup-
" ported near the pulleys by a long wooden frame which is
" laid down in the tunnel. Another long upper wooden frame
" is attached to or connected with the iron cross piece carrying
" the shaft; the latter wooden frame is furnished with cross
" pieces similar to the steps of a ladder, supported by two or
" three pairs of wheels travelling on rails laid down at the
" bottom of the tunnel.

"In working a perforating apparatus constructed according
" to this invention, several men are seated on boards with
" their back turned turned towards the working tools, one man

" being seated between every two steps of the ladder. Each " workman holding one of these steps pushes forward, and " thus draws back the ladder, and at the same time the cylin- " der in the manner usual in rowing boats. By repeating this " motion the boring tools will be made to enter the rock and " form a circular or annular channel. At each blow a slight " motion of the endless screw causes the toothed wheel to turn " round and describe a limited arc of circle, by means of which " the position of the boring tools is changed, and in this " manner small particles will be detached from the rock." Blasting completes the work.

[Printed, 4*d*. No Drawings.]

A.D. 1866, March 8.—N° 703.

DONISTHORPE, George Edmund.—Coal cutting machinery.

The object of this invention is to use the roof or floor of the working as the guide to the cut, instead of the rails upon which the carriage runs. For this purpose the carriage is fitted with an air cylinder, upon the piston of which is supported a platform carrying the cutting machinery. The piston, with its platform, is raised, until a previously adjusted set of wheels or rollers bear against the roof, after which the machine is set in motion. The cutting apparatus consists of an air cylinder giving rectilinear motion to a cutter or cutters fixed to the piston rod. The machine is shown supported upon rails attached to iron sleepers or bearers, such as are described in the inventor's Specification, No. 2612, A.D. 1864.

[Printed, 8*d*. Drawings.]

A.D. 1866, March 15.—N° 770.

MORTON, Robert.—(*Provisional protection only.*)—Tunnelling under rivers, &c.

A tubular shield with sharp projecting edges is forced by hydraulic pressure through the soft earth at the bottom of rivers, &c. The tunnel is built up in rear of the shield, by means of segmental rings of cast iron, the shield always overlapping the rings by about two feet, the joint being made tight. The hydraulic pressure for moving the shield is supplied by pumps inside the shield, and their fulcrum is an iron table abutting against the iron segments of completed work.

[*Printed, 4d.* No Drawings.]

A.D. 1866, March 19.—N° 807.

BEACHER, Edward, and GILLOTT, John.—Coal, &c. mining machinery.

Several cylinders are combined in a frame, carried on wheels and capable of axial adjustment. The cross heads of the pistons working in these cylinders are fitted each with a number of cutting tools; and the cutters of each cylinder may be made to cut deeper than those of the preceding one. The valve gear is such as to enable the stroke to be adjustable, and the strokes of the pistons are made to alternate one with another, so as to diminish recoil, and the compressed air used to produce the stroke in one cylinder is caused to effect the return stroke in the next. Elastic matter may be fitted to the rear ends of the pistons to reduce concussion. Each cylinder receives a feeding movement through ratchet gear, which, however, is so arranged that the cutters are required to repeat their strokes until a given depth is attained, before the feed can take place. The machine is secured by screws adjusted between the roof and floor of the mine.

[Printed, 2*s*. Drawings.]

A.D. 1866, March, 21.—N° 832.

DALBY, Samuel.—Coal cutting, &c. machinery.

Upon a carriage is placed a cylinder which communicates rotary motion to a crank shaft, arranged vertically, horizontally or otherwise. This crank shaft is fitted with a rotating cutter, consisting of curved arms bearing adjustable points, which are deeper in section than the arms themselves. This cutting apparatus when rotated against the face of the coal, cuts out a groove. The carriage is progressed by means of the action of ratchet gearing upon a chain pulley, the chain being secured at each end to fixed points.

[Printed, 10*d*. Drawing.]

A.D. 1866, April 5.—N° 974.

RICHARDS, Samuel. — (*Partly a communication from Fritz Abegg.*)—Boring rocks.

The drill is fitted in the end of a screwed shaft which passes through a steel nut contained in an iron tube, which surrounds the shaft. The rear end of this pipe is closed and fitted with a steel point or pivot which forms the base of resistance of the apparatus. As the screw shaft is turned by a ratchet lever the tool cuts into the rock, and in order to prevent the tube rotating at the same time, it is fitted with arms or stay pieces which are controlled by the knee of the workman while boring. If the resistance be excessive the tube will be allowed to turn also for a period.

"The borer or tool is to be made unsymmetrical "in order " to prevent it from sticking fast in the bore or hole of the " rock. One lap of the edge should be about two-tenths of an " inch longer than the other, and therefore the diameter of " the bore becomes two-tenths of an inch larger than the " diameter of the edge, so that the borer may be readily " extracted even from a horizontal hole when it is turned to " and fro with a suitable iron key for the purpose."

[Printed, 10*d*. Drawing.]

A.D. 1866, April 7.—N° 995.

SCOTT, THOMAS.—(*Provisional protection only.*)—Sinking tubes for mine shafts and wells, &c.

These tubes or cylinder are built up in lengths and while being sunk are made air-tight by a tight-fitting cover. By exhausting the air from their interior, they are forced downward by atmospheric pressure and are controlled in their descent by the admission of more or less air. "It is preferred " to make the bottom plates of each cylinder of steel, and in " some cases the sides of the cylinders may be carried up " some height above the air-tight covers in order to form a " tank, into which water may be pumped" to add weight to the atmospheric pressure. The cylinders may also be weighted by building in them a lining of brickwork.

[Printed, 4*d*. No Drawings.]

A.D. 1866, April 18.—N° 1091.

JONES, JAMES GRAFTON.—Coal cutting machinery.

This invention relates to improvements upon the machinery described in the patentee's Specification, No. 267, A.D. 1864, and consists in communicating the backward and forward motion to the machine, necessary at each stroke of the pick, by *means of a small* working cylinder, put into connection with the cylinder which works the tool. The piston rod of the smaller cylinder is attached to grip levers, which are carried by rings on the bosses of the wheels of the carriage. Thus alternately there is given a slight backward motion and then a forward motion; the backward motion taking place near the end of the stroke of the small piston, when the pick is in the work. Elastic rings are fitted in the cylinder covers to prevent concussion.

[Printed, 10*d*. Drawing.]

A.D. 1866, April 21.—N° 1136.

DONISTHORPE, George Edmund.—Coal getting machines.

It is proposed to cut a groove into the roof or floor of the mine, at a short distance from the working face and parallel with it, from which groove the requisite holding for steadying the machine is obtained. Wheels or guides may for this purpose, run in the groove, or wooden beams may be fixed therein.

The machine for cutting this groove, consists of a carriage running on rails and supporting a vertical cylinder, in the piston rod of which the cutter is adjustable. This piston rod communicates also rotary motion to a shaft upon which is an eccentric for working the valve gear. "The working the valve "from an eccentric ensures the cutter always cutting to an "even depth into the roof, as the cutter ceases to work unless "each blow given by it is of sufficient strength to enable it to "complete the stroke." To steady the machine, another cylinder presses a roller against the roof of the mine.

In some cases, instead of cutting a groove, the inventor proposes to bore holes at intervals, into which uprights may be inserted to secure the machine. In this case the cutting machinery slides on a bed on the carriage which is stationary.

The inventor describes the application of these improvements to the machine patented by him in A.D. 1866 (No. 703), when cutting a groove into the seam of coal close to the roof.

[Printed, 10*d*. Drawing.]

A.D. 1866, May 1.—N° 1224.

NISBET, John.—Coal, &c. cutting machine.

In this machine the cutting is performed by means of a tool fitted to a lever which is pulled round through an arc by means of toothed gearing. A segmental rack is attached to the levers at a point not far removed from the tool. A toothed pinion, actuated by the engine, gears with the rack and so draws the tool round, cutting or planing a curved groove. Studs are fitted in the rack which, coming in contact with a reversing lever, return the rack for the next stroke and so on. The machine is progressed by a windlass or otherwise, and while cutting, is steadied by screws adjusted against the roof or floor.

[Printed, 10*d*. Drawing.]

A.D. 1866, May 7.—N° 1299.

FIDLER, Edward.—"Machinery for holeing, cutting, get- " ting, and drilling coal or other minerals."

At the end of a horizontal bar there is fitted the cutting or boring tool. This has teeth on its sides as well as at its point, so that it may cut laterally as well as bore. This shaft or bar is rotated by an engine and is at the same time fed up to the work. The machine travels in front of the coal or other mineral and may be kept up to the work "by an ordinary " traversing motion." The machine first bores a hole, and then its movement works the tool in a lateral direction.

[Printed, 1*s*. 2*d*. Drawings.]

A.D. 1866, May 10.—N° 1341.

BLECKMANN, Johann Heinrich August.—(*A communication from Wilhelm Fehleisen and Ernst Fehleisen.*)—Blasting powder.

This powder is composed of finely reduced wood, nitrate of potassa, and charcoal, and sometimes where a quick explosion is required, ferrocyanate of potassium. These substances are thoroughly mixed, made into a paste, and granulated in the ordinary way.

[Printed, 4*d*. No Drawings.]

A.D. 1866, May 18.—N° 1411.

SHARP, James, and **SMITH**, Robert.—(*Provisional protection only.*)—Composition for blasting fuses, &c.

Two compositions are indicated. One consists of a mixture of nitre, charcoal, and sulphur, to which is added a quantity of

" unground or unpounded gunpowder." The other consists of a mixture of nitre, charcoal, chlorate of potash, ferrocyanide of potassium, and sulphur, to which the gunpowder is also added.

These compositions will burn under water, and are therefore " well adapted for making fuses for blasting rock below " water."

[Printed, 4*d.* No Drawings.]

A.D. 1866, May 31.—N° 1512.

PUNSHON, John.—(*Provisional protection only.*)—Signal bell of mines, tunnels, &c.

By means of this bell " not only are the proper number of " blows for each signal given " " but that number of blows, " and consequently that particular signal, is regulated at the " same time on the dial plate."

No further description is given of the apparatus; the provisional specification confines itself to indicating the advantages of such apparatus.

[Printed, 4*d.* No Drawings.]

A.D. 1866, June 14.—N° 1618.

BELLHOUSE, William.—Safety cage.

" Weighted levers turning upon centres " are " fixed to the " cage, the said levers are connected at one end to the winding " rope or chain, and their other ends are capable of acting " upon inclined pieces or wedges capable of sliding between " projections on the cage and the ordinary guide rods." Thus, should the rope break, the further descent of the cage would be retarded by the jamming of the wedges. Springs may be added to ensure promptness of action. They are likewise capable of being thrown into work by a hand lever in the cage itself, so as to afford the occupants means of stopping the descent at pleasure.

[Printed, 8*d.* Drawing.]

A.D. 1866, June 26.—N° 1701.

MILROY, John.—Apparatus for sinking pits, wells, &c.

A number of spades or digging and lifting blades, are hinged to the periphery of a horizontal frame, with raised edges.

These blades are capable of being closed into the frame and in that position they complete the bottom to the raised sides of the frame and form a water-tight receptacle. The apparatus is suspended and worked by chains. When it is lowered the blades hang vertically and enter the earth. If necessary, subsidiary chains passing round pulleys at the ends of timber spears, may be put into use to hold down the frame, while the next operation is performed. This consists in drawing or closing in the blades, by means of the chains, so that they finally enclose in the receptacle a load of earth which is raised to the surface.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, July 5.—N° 1784.

BRUNTON, John Dickinson.—Machinery for driving tunnels or galleries and sinking shafts. The cutting is performed by a number of rapidly revolving discs carried on arms which rotate round an axis (which the inventor styles "the planetary "axis") and which latter axis revolves round the central axis of the pit, tunnel, or gallery. In other words, while the cutters revolve round the planetary axis, the axis itself is caused to move in a circle or some other figure, according to the shape of the tunnel, around the central axis.

[Printed, 1*s*. 4*d*. Drawings.]

A.D. 1866, July 6.—N° 1788.

AYDON, Enoch Harrison, and FIELD, Edward.—Ventilating tunnels and sewers, &c.

Pipes are fitted in the crown of the tunnel, and also at each side near the floor level. They lead into a ventilating chimney or shaft, provided with steam ejectors, whereby a constant upward current is maintained. The pipes at the crown remove the lighter gases, those lower down the heavier.

"A similar system of steam induced currents may be made "use of for the ventilation of sewers and other similar "passages, in which case it is preferred that the steam employed be superheated, for the purpose of more or less "disinfecting the noxious gases."

The mouths of the pipes may be opened or closed by means of hinged doors.

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1866, July 13.—N° 1837.

DIETRICH, Charles Ferdinand.—(*Provisional protection only.*)—Compressing air for motive power in mines.

Water is pumped alternately into two reservoirs, the one being filled while the other is emptied. During the filling the air is forced out through a valve in the top of the reservoir, into a chamber whence it is drawn for use. While the reservoir is being emptied air flows in through another valve. The admission of the water into the reservoirs alternately is effected by means of "a slide valve working in a chest fixed between
" them, with which valve chest are connected the several
" pipes leading from the pumps into the chest, and thence to
" the bottom of the water reservoirs, and also from the ex-
" haust back to the water cistern. The slide valve is worked
" as required by means of a small cylinder and piston at the
" bottom of each water reservoir, into which cylinder water is
" admitted through a valve" worked by a float.

Another form of apparatus consists of "two cylinders, each
" of the same capacity as a pump, connected with them re-
" spectively by pipes. In this case the air is forced out of
" each cylinder alternately by the up and down strokes of the
" piston of the pump."

A column of water may also be used to work apparatus of the above character.

[Printed, 4*d*. No Drawings.]

A.D. 1866, August 10.—N° 2059.

COTTERILL, Charles Foster. — Earthenware pipes for sewage, &c.

This invention consists in building up pipes from segments fitted together with grooved and tongued edges, and breaking joint, one pipe within the other, and in filling the intervening space by running in a melted bituminous composition or cement. Round the segmental pieces which form the inner pipe, there are ribs, which ribs support the outer segments at the required interval and serve also to prevent the liquid cement running out from the space between the pipes. These ribs or rings may be of iron, detached if preferred. In some cases these pipes are built up on an earthenware sole or pedestal. The segments are in any case first dipped in a bath of melted composition to close any cracks or pores, and to facilitate adhesion of the cement. Pipes may also be made of segments without any intervening space filled as above. These pipes are surrounded by iron bands, and at the joints earthenware clip pieces are fitted, into the hollow of which the melted cement is run in.

Pipes made according to this invention may be "made " of sufficient size and strength to be used as conduits and " tunnels and other tubular structures."

[Printed, 1*s*. 6*d*. Drawings.]

A.D. 1866, September 21.—N° 2422.

DAVIES, George. — (*A communication from Thomas Roberts White and William Glenn Bedford.*)—(*Provisional protection only.*)—Fabric for hose, &c.

This fabric which is claimed to be "especially applicable " for forming tubes to be used with drills in boring artesian " wells," consists of a mixture of wire and threads of fibrous substance. The fibre is woven as the weft round wire warps, the latter being in a line with the axis of the tubing. The tube so made is waterproofed by being passed through a solution of india-rubber or other like substance, after which a thin sheet of rubber is caused to adhere to the surface.

[Printed, 4*d*. No Drawings.]

A.D. 1866, October 6.—N° 2578.

CLARK, William. — (*A communication from George Williams.*)—Hoisting apparatus and trucks for mines.

Guide timbers are placed in the shaft, between which guide wheels fixed on the elevator or bucket traverse up and down the shaft. The bucket is lifted by "bail or discharging levers " to which the hoisting rope is attached." The bucket rises " until the guide wheels meet an oblique and curved deflecting " guide, which causes them to diverge laterally from their " normal perpendicular line of travel between the guide " timbers, while the sides of the supporting bail or discharging " levers preserve their vertical position, and at the same time " the elevator or bucket is gradually canted or turned over " end on the axis on which it is mounted to the ends of which " the bail or discharging levers are pivoted, the guide wheels " resting in a track curving outwards and the discharging

" levers still ascending in a perpendicular line under the " guidance of the guide timbers until the elevator or bucket " is finally upset sufficiently to discharge the contents into " a shoot or water trough, as the case may be." These curved guides and shoots may be fitted at different levels in the shaft if desired, together with apparatus for holding the elevator or bucket while the load is being passed into it through a shoot. One set of elevators may ascend the shaft while another set is descending.

The trucks have doors or flaps at their ends hinged to the trucks at the top corners. They are secured by a latch which can only be opened by engaging with a projecting post placed for the purpose. In this way they may be used for carrying ore, but if the flaps be turned over on to the top of the trucks they may be used for transporting lengths of timber. These trucks may be raised in the elevators and discharged from them as above, the elevators having open ends.

[Printed, 1s. Drawing.]

A.D. 1866, October 17.—N° 2677.

TONGUE, JOHN GARRETT.—(*A communication from Christopher Retallick James and Nathan Woodhull Condict.*)—Mining machinery.

This invention, which is claimed as applicable for drilling " boring or piercing rock or stone," relates to the attachment of the tool to a "piston working in a cylinder, the lower end " of which is in constant communication with a reservoir of " steam, compressed air, or the two combined," "of a sufficient pressure to raise the piston," and tool, "and the upper " end of which cylinder communicates through a suitably " operated valve with a steam boiler in which there is a " pressure of steam sufficiently in excess of that of the steam " or fluid in the reservoir to act on the upper surface of the " piston," to deliver the blow.

It also relates to a combination, with two pistons working in separate cylinders, "of a valve having passages so operated as " to bring each cylinder alternately into communication with " the boiler, and so producing the alternate action of the " pistons." When only one piston is used, one of the cylinders may be smaller and be only used for working the valve.

It "also relates to means of operating the valve to alternate " the action of the two pistons by the action of each piston " alternately as it completes its ascending stroke, and whereby " the blow of the stamp," or tool "of the other or descending " piston is made or kept full on the work during and after " impact under the same pressure of steam on the piston " irrespective of any variation in the stroke."

Finally, the invention consists in constructing the pistons and arranging the valves, so that the incoming steam will exert " a tendency to partially turn the pistons for the purpose of " turning," the tools.

[Printed, 10*d*. Drawing.]

A.D. 1866, October 19.—N° 2708.

JONES, Charles.—Coal mining machinery.

The machinery is carried by a frame which is capable of turning or swivelling on a truck running on rails. A pair of cylinders work a crank shaft upon which a worm rotates a horizontal wheel. This wheel works a box crank through which the cutter bar is reciprocated. The cutting tools are fixed to the bar, "each on a stud, in such manner that they " are at liberty to make a partial revolution thereon. These " tools are short pieces of tempered metal, each with an aperture therein for the stud; their cutting ends are so formed " that they readily catch the coal both in moving away from " and towards the machine. When several cutting tools are " employed," one is placed "in advance of the other, that is " to say, the one nearest the machine will be first, the next " second and so on outwards. And this is requisite as a means " of practically increasing the length of the movement or " stroke of the bar, which is necessarily short. The cutter " next the machine when it takes a new cut brings the others " into position, so that each of the outer ones begins to cut " where the one inside it left off." The cutter bar is supported and guided in a projecting stayed frame. Apparatus is also provided for clearing the dust from the cut.

The rails upon which the carriage runs are made with a vertical web and a projecting flange at top and bottom. Between these flanges the supporting wheels run, and upon the top flange, friction wheels. By means of a screw the bearing and friction wheels may be caused to press the upper flange between them. A hand wheel actuating a pair of the carrying wheels progresses the machine.

[Printed, 10*d*. Drawing.]

A.D. 1866, October 26.—N° 2771.

GRESHAM, James Harebooth.—(*A communication from William Robert Whitehorn.*)—Safety fuses for mining.

A number of threads, previously saturated with a solution of saltpetre, are drawn from bobbins through a powder chamber fitted with a tube or nozzle. The bobbins are carried on a disc in the centre of which is the powder chamber. The whole is rotated by a strap and pulley. The threads pass in to the powder chamber through holes in its sides, and out through the nozzle, twisted together into a cord in which is enclosed a continuous column of powder. This cord is then enclosed in paper strips and passed through a bath of melted pitch or other composition. It is then lapped round with some woven fabric, again passed through the pitch or other waterproofing composition, and finally through a trough of plaster of Paris.

[Printed, 8*d*. Drawing.]

A.D. 1866, October 30.—N° 2797.

HUNTER, James.—Excavating and mining machinery. The claim in this patent is the "use and application of a fixed or stationary piston or pistons on which a cylinder or cylindric segment is oscillated, the cylinder or cylindric segment having a lever or levers with cutters, picks, or excavating tools fixed thereto, ... in contradistinction to a moving piston working inside a stationary cylinder as hitherto used."

[Printed, 10*d*. Drawing.]

A.D. 1866, November 9.—N° 2922.

DŒRING, Frederick Bernard.—"Boring engines."

This invention partly relates to improvements in matters of detail, such as the supporting shafts and the slide valve, upon the inventor's former Patent, No. 3218, 1865. It also relates to a method of fixing the frame of such a machine in its place, which is accomplished by wedges driven in between the top of the gallery or tunnel, and "bearing pieces" attached to the carriage, which "bearing pieces" "having three points of

" support prevent the carriage turning on a central axis." Tanks of water are also placed on "the back end of the carriage " frame," for the purpose of assisting the removal of debris and cooling the boring tool by a jet of water.

Sometimes an engine and boiler are placed on the stand, and the engine "may be employed through gearing to move the " frame back during blasting." In sinking shafts the "bearing " pieces" are somewhat differently arranged, the column which carries them being horizontal instead of vertical.

[Printed, 2*s*. Drawings.]

A.D. 1866, November 12.—Nº 2954.

ROUTLEDGE, William, and **OMMANNEY**, Frederick Francis. — (*Provisional protection only.*) — Apparatus for boring rocks or other substances, and consisting of "a cylinder, " valve box, and side passages, all of one piece, the cylinder " being at one end permanently closed, and at the other end " fitted with a gland or nut having a hole, in which is placed " a tool or cutter holder. In the interior of the cylinder there " is a long piston having its ends fitting the cylinder, the " intervening space between the ends being of less diameter " for forming a chamber between it and the cylinder, which " chamber communicates with passages leading to both ends " of the valve box, and also by a hole in the cylinder with the " atmosphere. The valve box has a circular bore, and is fitted " with a circular valve with the necessary passages, the box " being provided with a pipe or hole for the supply of compressed air, steam, or other motive power, and a pipe or hole " for the exhaust. At one side of the cylinder and valve box " there is a passage communicating with an opening in the " cylinder near [its closed end, and at another side a passage " communicating with an opening at the other end of the " cylinder, and also an opening leading to the tool or cutter " holder." The valve is worked by the piston.

[Printed, 4*d*. No Drawings.]

A.D. 1866, November 13.—Nº 2973.

DÄHNE, Frederick Wilhelm and **THOMAS**, David. — " Picks or mandrils such as are used for cutting coal and " *other minerals*."

According to this invention, "in place of making the head "of the pick or mandril in one piece," the points are made separate from the other part of the head, "so that they can "be removed and replaced at pleasure. By this arrangement "when the points become blunt they can be removed and "sent to the surface to be sharpened, whilst in the meantime "the pick may continue in use, another point having been "fitted into it." Sockets are formed in the head of the pick, and the movable steel points have stems which fit into these sockets, wherein they are secured by locking screws or other convenient means.

[Printed, 10*d*. Drawing.]

A.D. 1866, November 21.—N° 3063.

GLEDHILL, PETER.—Coal, &c. cutting machinery.

From the side of a carriage, running on rails parallel with the work, there projects a jib or arm with a pulley at its end. An endless chain carrying cutters, passes round this pulley, and also round another pulley on an upright axis on the carriage. As this axis receives its motion from some source of power in the carriage, the chain and cutters act upon the coal. The carriage is usually supported on two pairs of wheels and the axle of one swivels, to allow for irregularities in the laying of the rails. The hinder axle has a worm wheel, worked by a screw and hand wheel, for progressing the carriage. The jib or arm is pivotted so as to be turned in required directions.

In place of a jib and chain, a "segment arm receiving an oscillating movement "on its centre by means of a connecting "rod from a crank" may be used, such segment arm being furnished with teeth.

The Inventor also claims an arrangement of reciprocating pick machine on three wheels, "with the pick axis immediately alongside of the cylinder, and receiving its motion from "a connecting rod passing back from the outer end of the piston rod over the top of the cylinder." "A similar method of actuating the pick may be adopted when a four-wheeled "carriage is employed." When it is not required that the machine shall work right and left handed, the return of the pick may be effected by expanding the steam, used in effecting the previous strike, from the smaller to the larger area of the piston.

In order to avoid the necessity of laying rails in the working, a light framework or girder may be used, upon which, when placed in position, the carriage may travel and which, after the work is done, may be easily removed elsewhere. Steadying rails or girders may be added to the frame.

[Printed, 2*s*. Drawings.]

A.D. 1866, November 22.—N° 3065.

HASELTINE, George.—(*A communication from Charles Burleigh.*)—"Machinery for drilling rocks."

In this machine the drill is held tightly by means of a nut with a groove in it which fits a projection on the drill at the end of the piston bar. At the rear end of the piston the bar is prolonged, and it is furnished with an "annular cam," and it is spirally grooved or made in a polygonally twisted form, either of which methods in connection with a ratchet ring, communicates a partial rotation to the drill at each stroke. The cam before mentioned communicates motion by means of tappets to the valve. This valve is termed "a hollow double-"acting rotary valve," and is so constructed that the pressure of the air or steam will hold it firmly in its seat. A clamp for holding the drill frame is also described. It is so contrived that the machine may be revolved round the clamp as a centre, or advanced or withdrawn in line with the drill, so that an universal motion is obtained.

[Printed, 1*s*. Drawing.]

A.D. 1866, December 15.—N° 3301.

ROLLASON, Alexander.—Blasting cartridges and fuses.

The cartridge case is made of paper or suitable material, closed at the bottom. A fuse is placed in it, reaching to the bottom, and round it gun cotton or analogous substance is rammed or compressed by hydraulic pressure. The case is then closed and waterproofed.

If preferred, a hole may be left for the insertion of a fuse, or such a hole may be bored out to receive one.

"In making fuses, instead of using gunpowder, gun cotton "thread or gun cotton tubing is employed." This thread or tubing "may be saturated with a solution of chlorate or "nitrate of potash," and "when dry may be placed inside "a tube made of metal or fibre."

The cotton for filling the cartridge cases may also be saturated as above, for the purpose of increasing the explosive power.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 17.—N° 3310.

NEUMEYER, GUSTAV ADOLPH. — (*Provisional protection only.*)—" Gunpowder for mining purposes."

This invention has reference to that for which Letters Patent were granted to August Klein, in 1865 (N° 1636).

Instead of soaking the charcoal in soda lye and generally preparing the ingredients as described in such previous Specification, the Inventor mixes about 72 parts by weight of saltpetre with about 18 parts by weight of charcoal and 10 parts of sulphur. These ingredients are incorporated with 40 parts by weight of water to about 100 parts of compound, in a cylinder containing a number of revolving arms. The compound is not granulated.

[Printed, 4*d*. No Drawings].

A.D. 1866, December 22.—N° 3373.

SLOPER, JOSEPH.—(*Provisional protection only.*)—Obtaining motive power for driving mine ventilating machinery, &c.

A vertical shaft is erected, to the bottom of which is fitted a conduit, extending in a horizontal direction along the ground. The object of this conduit is to "catch the air and create the " most powerful current or currents of air through the 'con- " 'duit' and up the ascending shaft." The mouth of this conduit may be shaped in the best manner for the purpose, and a fan or fans may be added to increase the draught. To the upper part of the ascending shaft is fitted fan apparatus, by means of which the draught is utilized as a source of power.

[Printed, 4*d*. No Drawings.]

A.D. 1866, December 26.—N° 3395.

JORDAN, THOMAS BROWN, and **DARLINGTON**, JOHN.— Hydraulic boring apparatus.

In one form of apparatus a constant pressure is put upon the boring bar by means of water in a hydraulic cylinder. The reciprocatory motion is effected by means of a cam carried ton a shaft rotated by a turbine. This cam acts on and at right angles to a disc carried on the boring bar, so that as the bar is raised, it is also partially rotated by the friction between the cam and the disc.

In another form, the boring bar is attached to a piston working in a long cylinder by the pressure of water applied on alternate sides. Various kinds of valves may be used, actuated by hand or by a turbine. The tool is advanced by means of cogged nuts working on screwed bars and turned by the movement of the valve gear. The boring bar is rotated by means of a nut, sliding over a twisted or spiral bar, attached to a ratchet wheel.

Another apparatus is contrived for the purpose of using both water and atmospheric pressure. The tool is carried by a ram working in a water cylinder surrounded by a larger and annular air cylinder. By means of a valve apparatus, the water at a pressure is allowed to pass into the water cylinder and lift the ram. The return stroke, to effect the blow, is effected by the pressure of the atmosphere in consequence of the vacuum created under the piston in the air cylinder by the lift of the ram, caused by the water pressure in the other cylinder. The ram and air piston are united by a crosshead and piston rods. The tool is rotated by a rifled bar and ratchet gear, and the feed is so arranged that unless the tool reaches nearly to the end of its stroke before being arrested the feed is inoperative.

Various forms of water-pressure engines, suitable for hauling in mines, are described and illustrated. They are constructed with either oscillating or fixed cylinders.

The hydraulic boring apparatus may be used for sharpening the points of the tools, by placing the latter, when heated, in dies or swages, and submitting them to the rapid action of the pistons.

[Printed, 2*s*. Drawings.]

APPENDIX.

A.D. 1638, May 2.—N° 117.

HORSEY, Sir George, RAMSEY, David, FOULKE, Roger, and DUDLEY, Dudd.—"The makeing of iron with sea or "pitt coale, peate, or turffe," and "with the same to rost, "melt, or refyne all mettallꝭ of what nature soever."

This Patent contains a grant upon conditions to the patentees "to digge, open, search, and wòrke, wash, roast, and "stampe, and melt "all manner of mynes or oares of gould, "silver, copper, leade holding silver, or mixed with silver, and "quicksilver, or any of them," within the kingdom, "and for "that end and purpose to dreyne and convey waters out of or "to the said mynes, for the better workeing and drainyng of "the myndꝭ and pitts, or washing of the same" and to sett "vpp, and erect, and repaire any house or houses, edifices, "buildingꝭ, millꝭ, and workes, for the use and service of the "said mines and mynerall workes."

[Letters Patent Printed, 6*d*. No Specification enrolled.]

A.D. 1638, May 12.—N° 117a.

FRIZELL, William.—"The drayning and freeing from water "all manner of colepittꝭ, and other mynes and pyttꝭ."

A grant of Letters Patent for the term of fourteen years at a yearly rent of ten pounds, for "a newe invenc̃on, engine, or "way, for the drayning and freeing from water all manner of "colepittꝭ, and other mynes and pittꝭ." No description is given of the machine or method adopted.

[Letters Patent Printed, 4*d*. No Specification enrolled.]

A.D. 1789, July 30.—N° 1693.

SHORLAND, William.—Obtaining rotary motion applicable to mining operations.

The inventor thus explains his improvements :—

"First, a shaft, of any length or size required, commonly " known by or called a water-wheel shaft or a main shaft, " fixed upon new invented gudgeons and brasses to ease or " lessen friction. My method of making them is to have one " part of the round or bearing of common gudgeons to be " made in the same form or method of a tooth or cog wheel. " This part is to run or work upon a second cog wheel of any " height or size required. The other part of the round or " bearing of the gudgeon is supported on each side, forming " two perpendicular lines made with brass, iron, or any other " hard metals.

"My method of placing or fixing the machinery together " proper for working or performing its regular motion by the " help of the steam or fire engines :—The shaft being fixed as " above mentioned, I then add to the main shaft a catch wheel " or wheels, with proper catches, fixed to the first and second " levers, of any length or size the strength of the work or the " nature of the machinery may require. Also three levers " fixed in the manner following :—The first lever, one end " of which is fastened to the main shaft; at the other end is " fixed a chain leading to and fixed to the arch head of the " cylinder beam. The second lever is fixed in like manner to " the first, one end to the main shaft; at the other end is " fixed a chain leading to and fastened to a convenient part " of the third lever. And at one end of the third lever a " chain is fixed leading to and fastened to the arch head of " the cylinder beam likewise; the other end of this lever " works on a centre."

The "method of making the above-mentioned chains is to have " plates or links with teeth in one edge, and put together in " the common way or method with pins and keys, or rivetted " in the usual manner of steam or fire-engine chains." The chain works in "as many tooth wheels as the length of the " chain will require, to prevent its breaking or destroying " itself by its own weight."

[Printed, 4*d*. No Drawings. See Rolls Chapel Reports, 6th Report, p. 180.]

A.D. 1794, July 29.—N° 2004.

SLADEN, William.—Raising and conveying earth, stones, *&c.*

The buckets in which the substance to be raised is placed, are mounted on carriages and are capable of being tilted thereon by means of handles worked, by hand, through wire communicators. The carriages run on framing, and are propelled by a rope passing over a system of pulleys carried at the head of the frame. These pulleys and cogged gear are worked by hand or horse power. One carriage ascends while the other descends, the rope being endless and passing round the bottom end of the framing. The framing may be lengthened as desired, and can be placed in various angles and positions. The head of the framing is supported by a pair of wheels, fitted with iron tires which partially enclose the felloes.

[Printed, 6*d*. Drawing. See Rolls Chapel Reports, 6th Report, p. 146.]

A.D. 1804, July 2.—N° 2776.

HAWKES, William, the younger.—Chains for mines, &c.

The chains made according to this invention are built up of flat links fastened together by steel pins. A plate or bar of metal from which the link is to be shaped is first placed in a die and has a hole at each end accurately punched. It is then placed in other dies wherein the edges are sheared into the required shape. A bevelled thimble is then placed in each hole and upset by means of swages or dies. A number of the links so made are strung and secured on steel pins and so form a chain.

[Printed, 6*d*. Drawing. See Repertory of Arts, vol. 7 (*second series*), p. 90.]

A.D. 1813, February 24.—N° 3652.

SMITH, Joseph.—Chain for mines, &c.

This chain is made up of flat links secured together by pins. These links may be made in various ways, by stamping or swaging them, or as the inventor prefers, by passing bars or strips of metal between rolls so shaped as to give the required form to the links. Holes are then punched in them to take the pins, and the latter have washers or collets or enlarged heads, and are secured by screws, nuts, or cotters.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 31 (*second series*), p. 272; Rolls Chapel Reports, 8th Report, p. 98.]

A.D. 1821, February 27.—N° 4539.

PENNECK, Henry.—Winding from mines.

This invention chiefly relates to steam machinery, but it also includes an improvement in winding.

It consists in "fixing a similar rope to that by which the "kibble is hauled up to the ring at its bottom, and extending "it down the shaft, and attaching it to the bottom of the "other kibble, but so long as not to affect the lower kibble "by the action of landing the stuff out of the upper one, the "two kibbles having the rope which connects their handles "passed with sufficient rounds to give steadiness on the "barrel, which may be fixed on the shaft of the rotary engine" mentioned by the inventor, "and if a strong hook is sus-"pended by a rope at the mouth of the shaft, and a ring is "placed on the rope at the bottom of each kibble, but at a "sufficient distance to admit the kibble to be drawn up to "the whim sheave, which carries the rope to the rotary engine, and when the kibble is drawn to that height the hook "at the shaft's mouth is fixed in the ring before mentioned; "the motion of the rotary being reversed, the kibble will "descend and sufficient slack rope will be given to admit of "its being unloaded without difficulty, when the motion of "the machine should be again reversed, and the kibble again "brought up to the whim sheave, so as to tighten the rope; "the hook may be then removed, the motion of the machine "again reversed, and the kibble lowered away; and the one "rope and kibble will so completely balance the other kibble "and rope, that, except from the shaft up to the whim "sheave, the engine will only have to lift the contents of the "kibble then below it." This invention is claimed to give steadiness to the kibble, particularly "when the shafts under-"lie." "In order that the miners may be able to draw their "stuff from lifts of different depths, the ropes may be made "divisible by means of shackles placed at such distances," "and at the different lifts hooks should be placed suspended "as before mentioned at the mouth of the shaft, and rings "on the ropes at proper distances from the hooks to hold by."

The drawings do not show this improvement.

[Printed, 1*s*. 2*d*. Drawings. See Repertory of Arts, vol. 41 (*second series*), p. 65; *London* Journal (*Newton's*), vol. 2, p. 416; also vol. 3, p. 192.]

A.D. 1822, October 18.—N° 4716.

WILLIAMS, John.—“A method to prevent the frequent re-“moval of the pavement and carriage paths, for laying down “and taking up pipes, and for other purposes, in streets, “roads, and public ways.”

The patentee says :—“To effect this object I construct sub-“ways and passages capable when once formed of preventing “the frequent opening of the streets and roads.” “I propose “to open the ground to the required depth, say, of ten feet, “lay a course of bricks, stones, or iron nearly level, or rather “curved on the ground, five feet wide, with drains to go into “the sewer, raise a wall on each side five feet high, and arch “it over, so as to leave the height in the centre of it seven “and a half feet clear; leave openings of nine inches in each “upright wall at the distance of every twenty feet, three feet “from the base; from these openings carry tunnels to the “sides of the streets, and at the end of the tunnels fix gratings “or doors, to be opened from the inside; leave similar open-“ings in the top of the arch at the distance of every hundred “feet, for the admission of light and air, and doorways five “feet high and three wide in each side wall, where these “openings are made. These sub-ways may be entered at the “sides by doors and passages wherever required, from the “houses and buildings in the streets and roads, in the same “manner as into cellars that are under the streets, and the “main pipes for every purpose may be placed therein on iron “cradles or otherwise, and the service pipes for the supply of “the public through the tunnels or openings in the side walls. “These sub-ways may also be formed double, or another “parallel to the first one for water, and the other for gas “pipes.”

[Printed, 4*d*. No Drawings. See Repertory of Arts, vol. 42 (*second series*), p. 204; London Journal (*Newton's*) vol. 5, pp. 9 and 29; and Engineers' and Mechanics' Encyclopædia, vol. 2, p. 646.]

A.D. 1823, August 20.—N° 4838.

GOODE, John.—Tools or apparatus for boring the earth.

Very many tools for this purpose are illustrated and described in this Specification. The boring tools vary according to the nature of the ground intended to be operated upon. For clay and similar soils a cylindrical auger is used, having a longitudinal opening the whole length, and at the bottom a leading and cutting edge. For sandy or wet soils, a cone surrounded by a spiral edge piece is used. The spiral delivers the soil into the interior of the cone. Another form of cutter is described, consisting of a complete cylinder, with a cutting piece at bottom, and an internal valve for the purpose of retaining debris. A somewhat similar tool is shown for the purpose of extracting water and loose sand from borings.

In addition to cutting tools, there are tools for seizing and lifting broken bits, &c., tools for widening and rounding the hole, for sinking through stone, for forcing down pipes, for forcing out any indentation in the pipes, for turning the pipes while sinking them, for raising pipes, and for bringing up loose stones.

The inventor uses by preference iron and tin for all parts, except cutting parts, which are made of steel.

Part of the invention relates to raising water from wells.

[Printed, 10*d*. Drawings. See Repertory of Arts, vol. 4 (*third series*), p. 113; London Journal (*Newton's*), vol. 8, p. 246; Register of Arts and Sciences, vol. 2, p. 113.]

A.D. 1833, March 23.—N° 6400.

HORTON, Joshua.—Flat iron chains.

These chains are made up of links, consisting of cylindrical bars having at each end a perforated disc or eye. The link after being forged in the rough is struck in a die to form the ends. The superfluous metal or fin is clipped off, and the ends are faced and drilled. The links are put together in sets by means of rivets or pins.

[Printed, 6*d*. Drawing. See London Journal (*Newton's*), vol. 14 (*conjoined series*), p. 310.]

A.D. 1836, August 11.—N° 7166.

PARKES, Henry Pershouse.—Flat pit chains.

The inventor claims "the application of wrought iron or " other metal stays to flat pit chains in such manner that the " links where the stay is used shall be combined into one " plane, and kept into their proper positions for forming a " flat chain, whatever be the number of links used in the " same plane," but he does not claim "the application of " iron stays to chain links, unless two or more be thereby " combined into one plane."

The stays are made by rolling a bar into the required shape with the necessary grooves, and then cutting lengths off such bar, each length constituting a stay. The stay is placed between the links, which are then hammered, and are thus caused firmly to bind the stay within the links.

[Printed, 10*d*. Drawing. See Repertory of Arts, vol. 7 (*new series*), p. 307; London Journal (*Newton's*), vol. 13 (*conjoined series*), p. 138.]

A.D. 1839, February 23.—N° 7981.

PRATT, Thomas. — "Winch for raising coal," &c. "from "mines."

The improvements which form the subject of this patent relate to capstans and windlasses, amongst which is described a winch for mining purposes.

One rope only is used, one end carrying the descending the other the ascending corve. The two ends pass over pulleys supported by separate frames over the shaft, and the bight is passed in and out of three pulleys gearing into one another, the centre and largest being the driving pulley. The pulleys are grooved to furnish friction and prevent slipping.

[Printed, 1*s*. Drawing. See Inventors' Advocate, vol. 1, p. 67.]

A.D. 1839, March 6.—N° 7997.

HORTON, Thomas, and SMITH, Thomas.—Flat chains for mines, &c.

The object of these improvements is to dispense with the rivets or pins for holding together the links, which rivets or pins are said to be uncertain in their holding powers.

According to this invention every other link consists of a flat plate of iron perforated with two rows of holes. These plates or links are joined by a number of wrought-iron links, of round or square pattern, of the ordinary chain shape, which are passed through the holes in the plates and welded. Wood stays are passed through these connecting links, and secured by iron studs.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 15 (*new series*), p. 154; London Journal (*Newton's*), vol. 15 (*conjoined series*), p. 219; Inventors' Advocate, vol. 1, p. 83.]

A.D. 1839, March 12.—N° 7999.

CUTLER, Job.—Chains for mining and other purposes.

The chains described in this specification are constructed upon the following principle. The flat links are not only to be held together by pins or rivets, but are to interlock among themselves. For this purpose the links in one set are each provided with a projection or rim on each side around the pin hole, while the links in the next set are shaped with corresponding depressions or recesses round the pin holes, into which recesses the projections on the former links fit. Pins or rivets are now inserted and other pins through the sides of the links in the middle of their length. Washers are also placed between the links.

A modification of the above is described in which the projections on two links pass completely through a hole in the end of another link, and meeting form the axis upon which that link turns. A bolt or rivet is of course used to hold the links securely together.

The links used in constructing the above chains are made by stamping in suitable dies.

[Printed, 8*d*. Drawing. See Repertory of Arts, vol. 13 (*new series*), p. 242; Inventors' Advocate, vol. 1, p. 99; Transactions of the Society of Arts, vol. 54, p. 159; Webster's Reports, vol. 1, p. 418; Carpmael's Reports on Patent Cases, vol. 2, p. 523; Mylne and Craig's Reports, vol. 4, p. 510; and Billing on Patents, pp. 24, 79 and 142.]

A.D. 1839, June 18.—N° 8114.

WRIGHT, John.—(*A communication.*)—"Certain improve-
" ments in mixing or alloying iron with other metals for the
" purpose of increasing its strength, tenacity, or cohesion,
" which alloys, among many other uses, are particularly ap-
" plicable to the construction or manufacture of links for
" chains and rings, and certain machinery for effecting such
" manufacture."

This invention consists firstly, in immersing articles formed of wire or strips of iron, such as links of chains, consisting of wire hanks or coils, in molten copper, or in pouring molten copper around such articles when placed in moulds, for the purpose of increasing their strength and tenacity.

It further consists in means of preparing such links. For this purpose wire is wound round a pulley and the hank secured. The parts of the pulley are then separated and the link removed, or rather the pulley is put together again with the link inserted in the open centre of the pulley. By this means another link or hank can be wound on the pulley so as to link with the first made hank, and so on.

In making links for flat mining chains, the groove in the pulley is square in section, and the wire is guided by suitable apparatus.

The patentee filed a disclaimer and memorandum of alteration, by which he gave up the use of the word "alloy" as improper.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 16 (*conjoined series*), p. 121; vol. 21 (*conjoined series*), p. 478 for disclaimer; Inventors' Advocate, vol. 2, p. 20.].

A.D. 1841, November 16.—N° 9160.

NEWALL, Robert Stirling.—Bands for mining purposes.

These bands are made exclusively of iron or other metal, which is drawn while in a heated state through steel dies, as in tube and wire drawing. The various lengths of metal so prepared are joined by scarfing and rivetting, in preference to welding and brazing.

Mine bands are also to be made of strips of metal, arranged side by side and fastened to cross pieces at intervals. While the cross pieces are being rivetted on the strips are kept in a state of tension by weights acting over pulleys.

The inventor also proposes to make a flat band by weaving narrow strips or wires in a loom, the strips or wires which constitute the warp being wound on separate bobbins and kept at a uniform tension during the operation of weaving. The weft will generally be of smaller size than the warp.

[Printed, 1*s*. Drawing. See Repertory of Arts, vol. 18 (*new series*), p. 72; Mechanics' Magazine, vol. 36, p. 414.]

A.D. 1842, March 7.—N° 9282.

WARRICK, John.—(*A communication.*)—Indicating the presence of gas in mines.

This apparatus, called by the patentee, a "gasoscope," consists of a globe of very thin glass, supported upon a vertical rod from the end of a beam working under water. This beam is furnished with a hollow float and ballast, in order to ensure accurate adjustment. If gas should be present and mix with the air in which the globe is poised, the latter, in consequence of the tenuity of the atmosphere, will descend a little. A bar of iron attached to it then comes within the range of attraction of a magnet which draws it down still further and sounds an alarm by a bell or otherwise.

The water in the tank is covered with a film of oil to prevent evaporation, and in order still further to place the apparatus in equilibrium, a similar globe with float and ballast, is placed at the other end of the beam. This globe is placed in a bell glass with barometric fittings so arranged that gas cannot enter the bell. There is also a phosphorescent indicator which shows in the dark and in case of absence, that the apparatus has been acted upon.

[Printed, 10*d*. Drawing.]

A.D. 1843, March 21.—N° 9674.

TAYLER, JOSEPH NEEDHAM, and SMITH, WILLIAM HENRY.—Tunnel for landing passengers, &c.

The inventors propose to construct a tunnel from the pier to some convenient place on "land," through which passengers and goods can be transported. The tunnel curves downwards from the pier and rises again at the land end to about the same level. It is fitted with a railway. The carriage containing the passengers or goods is allowed to run down by its own weight from the pier and its momentum carries it very nearly to a corresponding level at the other end. Here it is sustained by a rack and pall while the passengers get out or the goods are unloaded. It is then hauled up to a higher level to prepare for its return journey.

The tunnel is bored by means of a circular shield having a projecting cutting lip or edge radially across it. It is carried in a central axis screwed for progression and fitted with a gimlet point in advance of the shield whereby the latter is guided. By means of a screwed bar and nut at the rear extremity of this axis, it is moved to various angles in order to enable the boring to follow the curved line required.

[Printed, 2*s*. 8*d*. Drawings.]

A.D. 1844, February 13.—N° 10,050.

HAINES, JOB, and HAINES, RICHARD.—Flat chains for mines.

This invention consists in proportioning the links in such a way that at the middle parts of their length they are of a somewhat oval section, and at the ends they are enlarged to the forms of bosses of an oval figure, "which are thicker as " they appear edgeways in the front view, and wider as they " appear in the side view, than the iron is at the middle parts " *of the links*, so as to leave a suitable quantity of metal at

" each side of the pin hole (which is drilled through each end " of each link), for giving strength." The alternate sets of three links are all alike in section, but the outer links of the sets of four are little more than half the thickness of the other links, and are flat at their inner sides.

To make the links, bars of iron are first passed through rolls, having recesses at intervals to shape the bosses. Guards are provided to prevent the bars sticking in the rolls. The bars are then divided into blanks, and each blank is shaped in dies and drilled.

[Printed, 10*d*. Drawing. See London Journal (*Newton's*), vol. 25 (*conjoined series*), p. 166; Engineers' and Architects' Journal, vol. 7, p. 322.]

A.D. 1844, February 17.—N° 10,058.

LOSH, William.—Chains for mining, &c.

This invention "consists in constructing chains of wire or " elongated metal, and in such manner that each link is " formed by coiling wire or elongated metal several times, " and then fastening the two ends, and afterwards causing " each link to be interlinked and bent into other links of the " same kind, so as to form a continuous chain."

"If it be required to have a flat chain for mining or other " purposes," several of these chains are combined " by placing them side by side and uniting them together by means " of wire interlaced through them or by rivets, much in the " way that hemp ropes are united for similar purposes."

[Printed, 6*d*. Drawing. Repertory of Arts, vol. 4 (*enlarged series*), p. 357; Engineers' and Architects' Journal, vol. 7, p. 323.]

A.D. 1844, March 14.—N° 10,101.

PARKES, Henry Pershouse.—Flat pit chains.

One form of chain described in this Specification is made up of flat plates of metal punched, bent, and welded, and then secured at the knuckles by pins in such a manner that the chain closely resembles a succession of ordinary hinges.

Another form consists of alternately one and two flat links formed by bending up plates of iron and welding the lap, held together by pins and furnished with side links shaped out of flat pieces of iron.

The iron from which the flat welded links are made is so rolled or forged as to produce extra thickness at the parts where the wear will take place.

[Printed, 10*d*. Drawing. See London Journal (Newton's), vol. 25 (*conjoined series*), p. 240.]

A.D. 1845, January 16.—N° 10,468.

LUCAS, Edwin.—Constructing the links of flat or pit chains.

These improvements relate to the construction of chains generally, but a part has reference to the construction of links of mine chains.

The tool which is described as suitable for this purpose consists of two pegs or mandrils, around which the two loops of the link are formed, furnished with top and bottom and side dies or swages. Two cranked arms worked by gearing bend the ends of the bar of heated iron around the pegs or mandrils, after which, the cranked arms having returned to their normal position, the top die or swage descends and compresses the link between it and the bottom die, the side dies assisting to complete the work.

By a disclaimer, enrolled 15 Feb. 1855, the patentee disclaimed the above and other parts of his invention.

[Printed, 1*s.* 2*d.* Drawings. See Macrory's Reports, p. 234, for Disclaimer.]

A.D. 1847, February 24.—N° 11,589.

BAYLISS, William.—"Flattening and turning iron links for "flat wood stub chains."

This invention consists "in forming the links of what are "commonly called flat wood or stub chains, the sides whereof "are flattened, while the ends or parts where the connection "of the adjoining links (in the length of the chain) takes "place are of a cylindrical form," by mechanical means instead of by hand labour.

A machine for this purpose is described, in which a bar of heated iron is first shaped between dies or swages, worked by levers, and is then doubled by being forced between two vertical standards by means of a horizontal pusher bar also moved by levers.

[Printed, 8*d.* Drawing.]

A.D. 1852, October 20.—N° 462.

SLADE, Jacob Tilton.—Safety hoisting apparatus.

The cages are suspended from the ends of a rope passing over a pulley at the top of the shaft, to which pulley motion may be communicated in either direction. The cages are not attached directly to the rope, but through short intermediate lengths of rope, fastened to the long ends of levers fixed to the cage.

These levers are placed so that the shaft guide passes between their short ends. The weight of the cage in the suspending links keeps these levers free from the guides, but should the rope break springs help to draw down the long ends of the levers, and so compress the guides and prevent too rapid descent of the cage. A brake is fitted to the winding pulley, so as to be worked at will from the cage by means of a rope extending down the side of the shaft.

[Printed, 8*d*. Drawings.]

A,D. 1852, November 20.—N° 804.

ELLIS, Thomas, senior.—(*Provisional protection only.*)—Flat metallic bands for winding.

The inventor thus states the nature of his improvement :—
" I propose to construct flat bands for " winding purposes of
" solid flat bars of iron or steel, about $\frac{3}{16}$ of an inch thick,
" more or less, according to the nature of the material em-
" ployed and about 4 inches broad, more or less, according to
" the work required to be done by such bands. In some
" cases I propose to unite or combine flat bars of iron and
" steel together, so as to form flat bands for winding and other
" like purposes, which bands will be used in place of hempen
" bands or wire ropes, as heretofore employed for such
" purposes."

[Printed, 4*d*. No Drawings.]

A.D. 1853, December 16.—N° 2936.

WAITHMAN, Robert William.—Belts or bands for use in mines, &c.

This invention consists in making the bands in the form of tubes or hose, of "linen or other suitable fibrous materials," and if necessary with " wires or other metallic portions woven " therein." These bands may be used as they come from the loom or other machine, or they may be waterproofed and cemented so as to form a flat band. For the latter purposes various compositions are used, one having inspissated tar as a basis, another consisting of india-rubber and ground peat or bark, and a third of gutta percha or caoutchouc dissolved in gas tar.

[Printed, 4*d*. No Drawings.]

A.D. 1856, May 23.—N° 1229.

RUSSUM, Thomas Dawson.—Brake for winding engines.

This brake consists of two discs, having peripheries of a conical figure, the one being concave and the other convex, placed respectively upon a fixed support and the shaft of the engine, that upon the engine shaft being capable of sliding upon the shaft, and being thus made to engage with that on the fixed support. In order to effect the movement, a weighted lever is used, the weighted end resting upon an inclined carriage. This carriage has only to be moved out of the way by the engine-man or other person to allow the weighted lever to act and draw the disc on the shaft into contact with that on the support. The same operation shuts off the steam.

[Printed, 6*d*. Drawing.]

A.D. 1856, November 11.—N° 2655.

BAINES, Hugh.—Safety hoisting apparatus.

Bearing upon the suspensory rope at any convenient place are two or more excentrics or pulleys attached to a lever or levers in connection with vertical rods, extending from the top to the bottom of the 'hoist' well or pit. So long as the rope remains unbroken these levers sustain the vertical rods, but should the rope break, the vertical rods fall, and in so doing thrust out horizontal catches, which engage with racks on the cage. These racks are in turn forced upwards and their upper ends, being wedge shaped, press behind other catches and force them into contact with racks on the pit guides. As soon as the vertical rods fall they also are securely held in that position by racks and palls at the bottom. India rubber pads are placed behind the catches to prevent excessive concussion. The cage is also provided with a disengaging hook and trigger to prevent overwinding.

A counterbalance to the cage is also provided with an unequally balanced lever catch, held from the racks by the suspensory rope.

Improved reversing gear is also added, the object of which is to prevent the cage, when the engine is at rest, being reversed from the direction in which it was moving when the engine stopped.

[Printed, 10*d*. Drawing.]

A.D. 1857, February 6.—N° 338.

MYERS, Henry, ASKEW, Charles, and ASKEW, John.—Communicating in mines.

For this purpose a speaking or "phonic" tube is placed in the shaft, extending from top to bottom and supported in brackets or bearings in which it is capable of turning. At each level it is fitted with bevilled gear by means of which its rotation may be communicated to similar but horizontal tubes in the workings. The several tubes are fitted with handles by which they are turned, with indicators acted on by tappets at their respective heads, and mouth pieces for speaking purposes.

[Printed, 8*d*. Drawing.]

A.D. 1857, February 13.—N° 424.

RICHARDSON, William.—"Improvements in the use of " iron or any other metal by itself or in combination with " other materials for structural purposes."

For "water mains or sewers," the inventor constructs a tube of iron plates, flanged together, and made tight at the joints with india-rubber or some similar substance. If great strength be required the plates forming the upper part of the tube may be cast with a ridge along them, which ridge, when the plates are all bolted together, forms a species of girder along the top of the tube, somewhat like the back fin of a fish. The inside of the tube may be enamelled or lined with asphalte; or within it a second tube is built up of earthenware or brickwork, and the space between the two tubes filled in with some non-conducting material. The inner tube is connected with the outer by stays. If the inner tube be made of pottery, such ware is made in segments, "grooved and bevilled, so as to fit each " other and form a circular tube."

[Printed, 1*s*. Woodcuts and Drawings.]

A.D. 1857, March 10.—N° 701.

BAYLIS, Charles.—Constructing and arranging roadways, sewers and subways.

Three tunnels or subways are constructed; the centre one serves for the sewage, the other two for the gas and water mains and the telegraph wires. Above the tunnels are lines of rail and tramways, and above these again the roadway for ordinary traffic. An opening of six feet in width is left along the centre of the roadway to afford light and air to the railways. The subways are fitted with iron man-hole doors, and if desired strong glass lights. The sewage from the houses is carried across the side subways to the centre, in iron pipes. In some cases the footways may be carried on a still higher level, leaving the roadway quite clear for vehicles. In this system, the shops would have to be arranged at the first floors of existing houses, the old shops being used as warehouses or maintained.

[Printed, 6*d*. Drawing.]

A.D. 1857, October 31.—N° 2767.

OWEN, James. — (*Provisional protection only.*) — Safety hoisting apparatus.

"The apparatus for stopping the descent of the 'box' to
" avoid accidents, consists in an arrangement of levers suitably
" situated and attached to the chamber, and in connection
" with a handle inside the chamber; to these levers are
" connected a series of 'catches,' which may by the movement
" of the handle and levers be either forced outwards into
" suitable upright bars or rods provided for the purpose, and
" extending from the top to the bottom of the hoist or well
" hole, or they may be so arranged as to close inwards and
" 'grip' the bars, and such bars may if preferred have
" 'notches' or recesses formed therein, into which the catches
" may be thrown, and thereby enable them to retain a firmer
" hold."

Printed, 4*d*. No Drawings.]

CATALOGUE OF BOOKS AND OTHER PUBLICATIONS RELATING TO MINING, QUARRYING, TUNNELLING, AND WELL-SINKING.

[It is not pretended that this catalogue is entirely comprehensive, but it will be found to contain the principal works of importance, both historically and technically, and no publication which could be of material value in affording the assistance desired by the searcher and general engineer has knowingly been omitted.

In the first list the books have, as far as possible, been arranged in chronological order; while the periodical publications have been placed alphabetically, with the exception that this list concludes with a few particular references to information occurring in publications not of themselves of a nature to warrant their importation into the general list.

The catalogue is completed by a list of the chief encyclopædias and dictionaries, in the pages of which will be found, here and there, more or less information on the above subjects.]

List of Books and other Publications relating to the subject of this series of Abridgments.

Georgii Agricolæ de re metallica. Basileæ, 1561.

Fodinæ Regales, or the History, Laws, and Places of the Chief Mines and Mineral Works, Mint and Money of England and Wales, and the English Pale in Ireland; with an explaining of some difficult words relating to Mines and Chemistry. Sir J. Pettus. London, 1670.

Rara Avis in Terris; the Complete Miner, or a collection of the Laws, Liberties, and Customs of the several mines in the counties of Derby, Gloucester, and Somerset; with the art of dialling and levelling groves. T. Houghton. London, 1681.

A Complete Treatise of Mines, extracted from the Mémoires d'Artillerie. H. Manningham. London, 1752.

Philosophical and Practical Essay on the Gold and Silver Mines of Mexico and Peru; containing the nature of the ore, the manner of working the mines, and refining the metals. Father J. Hernandez. London, 1755.

The Miners Guide, or Compleat Miner. By Wm. Hardy. 2nd ed. Birmingham, T. Warren, jun., 1762.

Traité de l'Exploitation des Mines. L. W. Monnier. Paris, 1773.

Anleitung zu der Bergbaukunst, von Christoph Traugott Delius. Wien, 1773.

Voyages Métallurgiques ou Recherches et Observations sur les Mines [in various countries], suivies d'un Mémoire sur la circulation de l'air dans les mines. Par Gabriel Jars, vol. i., Lyons, G. Regnault, 1774; vol. ii., Paris, H. Séguin, 1823; vol. iii., Paris, Didot, and others, 1781.

Mémoire sur la Manière dont on extrait en Corse le Fer de la Mine d'Elbe, &c. Tronson du Coudray. Paris, 1775.

The Method of discovering and working of Tin, Copper, and Lead Mines, and cleansing and metallizing their products. W. Pryce. London, 1778.

Traité sur la Science de l'Exploitation des Mines. Christophe T. Delius. Paris, 1778.

Treatise on all Sorts of Mines. E. Leach. London, 1790.

Reports with plans, sections, &c. of the proposed dry tunnel or passage from Gravesend to Tilbury. By R. Dodd. London, J. Taylor, 1798.

Observations on the intended tunnel beneath the river Thames. Charles Clarke, F.S.A. London, 1799.

A Description of the most interesting Mines in the North of England, in Scotland, and in Wales. J. Maine. London, 1802.

Observations on the Advantages and Practicability of making Tunnels under Navigable Rivers, particularly applicable to the proposed Tunnel under the Forth, with an Appendix, containing Reports of Surveys and Opinions of Engineers relative to this undertaking. By James Millar, M.D., F.R.S. Edin., 1807.

The Miners' Guide, or Complete Miner, containing the Articles and Customs of the High Peak and Wapentake of Wirksworth, Derbyshire; selected, arranged, and printed (verbatim) from the works of Hardy and Houghton. Wirksworth, J. Cotes; London, Crosby & Co., 1810.

A Treatise on the Coal Mines of Durham and Northumberland. By J. H. H. Holmes, F.S.A. London, Baldwin, Cradock & Joy, 1816. (Treats also of "New Methods of "Ventilation, &c.")

On a Method of Ventilating Coal Mines. By James Ryan. London, printed for the Society of Arts, 1816.

New Theory of the Formation of Veins, with its Application to the Art of Working Mines. Chas. Anderson, M.D., (from the German of A. G. Wener). London, 1819.

Traité sur les Puits Artésiens. Par F. Garnier. 2nd ed. Paris, Bachelier, 1826.

An Historical Account of Sub-ways in the Metropolis. By John Williams. London, Carpenter & Son, 1828.

Élémens pratiques d'Exploitation. Par C. P. Brard. Paris, F. G. Levrault, rue de la Harpe, 1829.

Evidence given before the Committee of the House of Commons on the London and Brighton Railways on the subject of Tunnels. London, 1837.

An Account of the Wharton and Marston Salt Works, with sections of sinkings, tubbing, &c. (In Patent Office Library) ? 1839.

Des Moyens de soustraire l'Exploitation des Mines de Houille aux chances d'Explosion. Recueil de mémoires et de rapports publié par l'Académie Royale des Sciences et Belles-lettres de Bruxelles. Bruxelles, M. Hayez, 1840.

Datos y Observaciones sobre la Industria Minera. Por Joaquin Ezquerra del Bayo. Madrid, Ant. Yenes, 1844.

Exploitation des Mines. Par J. F. Blanc (Part 1, Coal; Part 2, Iron, Lead, Copper, Tin, Silver, Gold, Zinc, Diamond, &c.) (Libraire Encyclopédique de Roret.) Paris.

Practical Tunnelling; explaining in detail the setting out of the works, shaft-sinking and heading-driving, ranging the lines and levelling under ground, &c. By Frederick Walter Simms. London, 1844.

A Treatise on the Winning and Working of Collieries. By Matthias Dunn. Newcastle-on-Tyne, 1848.

On the Ventilation of Coal Mines. By William Brunton, M. Inst. C.E. London, Nichols & Son, 1849.

Traité de l'Exploitation des Mines de Houille. Par A. T. Ponson. 4 vols. Liége, E. Noblet, 1852–4.

Improved System of Ventilating Coal Mines. By Joseph Jones. Manchester, printed by Geo. Falkner, 1854.

Rudimentary Treatise on Well-digging, Boring, and Pump-work. By John Geo. Swindell. 3rd ed. revised by G. R. Burnell. London, John Weale, 1854.

A Practical Treatise on Mine Engineering. By G. C. Greenwell. Newcastle-on-Tyne, M. & M. W. Lambert, 1855. 2nd ed. 1870.

The Practical Railway Engineer. By G. Drysdale Dempsey. 4th ed., 4to. London, John Weale, 1855.

A Treatise on Waterworks. By Samuel Hughes. London, John Weale, 1856.

Rudimentary Treatise on the Blasting and Quarrying of Stone. By Lieut.-Gen. Sir John Burgoyne, K.C.B. London, John Weale, 1856.

Mécanicien-Fontainier, Sondeur, Pompier et Plombier. Par MM. Janvier, Biston et Malepeyre. 1 vol. plates. (Libraire Encyclopédique de Roret.) Paris, 1857.

A Treatise on Metallurgy, comprising Mining and General and Particular Metallurgical operations. By Frederick Overman. 4th ed. New York, D. Appleton & Co., 1857.

Dumas' Brunnen-Ingenieur. Von C. H. Schmidt. Weimar, Voigt, 1857.

The Forest of Dean, an Historical and Descriptive Account. By H. G. Nicholls, M.A. London, John Murray, 1858. (Gives an account of the iron mines, tools, &c.)

The Chemistry and Metallurgy of Copper, including a description of the principal Copper mines of the United States and other Countries, the Art of Mining and Preparing Ores for Market, and the various processes of Copper Smelting, &c. By A. Snowden Piggot, M.D. Philadelphia, Lindsay & Blakiston; London, Trübner & Co., 1858.

The Rudiments of Hydraulic Engineering. By G. R. Burnell. London, John Weale, 1859.

Practische Anleitung zur Anlage und Benutzung gegrabener und gebohrter oder sogenamiter artesischer Brunnen. Von C. Hartmann. Weimar, Voigt, 1859.

A History of Coal, Coke, Coal-fields, progress of Coal Mining, the Winning and Working of Collieries, &c. By W. Fordyce. London, Sampson, Low, Son & Co., 1860.

On Underground Mineral Transit. By James Ferguson. *Excerpt* Minutes of Proceedings of the Meeting of the *Institution* of Engineers in Scotland, 1861.

Mining in the Pacific States of N. America. By John S. Hittell. San Franciso, H. H. Bancroft & Co., 1861.

Le Matériel des Houillères en France et en Belgique. Description des appareils, machines, et constructions employés pour exploiter la houille (avec Atlas in-folio, de 77 planches). Par Amédée Burat. Paris and Liége, E. Noblet, 1861.

Our Coal and our Coal-pits. By a Traveller underground. London, Longman, Brown, Green, Longmans, and Roberts, 1862.

Russian Miner's Book; containing the History of the Russian Mining Works, with statistics, tariff, etc. (In the Russian language.) 8vo. St. Petersburg, 1862.

Practical Mineralogy, Assaying, and Mining. By Frederick Overman. 5th ed. Philadelphia, Lindsay & Blakiston, 1862.

A Practical Treatise on Mining, Land and Railway Surveying, Engineering, &c. W. D. Haskoll. London, 1863.

On the Method of Working the Calamine Deposit of Altenberg, near Aix-la-Chapelle. By Wilhelm Jung of Bonn, 1863.

Des Travaux de Percement du Tunnel sous les Alpes et de L'Emploi des Machines dans l'Intérieur des Mines. Avec Atlas. Par A. Devillez. Liége, Renard, 1863.

Traité de l'Or, monographie, histoire naturelle, exploitation, statistique, son rôle en économie politique, et ses divers emplois, par M. Landrin. Paris, Guillaumin & Cie., 1863.

On the Ventilation of Mines. R. Moore, 1864.

History of the Rise and Progress of Mining in Devonshire. C. Chowen, London, 1864.

Railway Construction. By W. Davis Haskoll. London, Atchley & Co., 1864.

A Practical Hand-book for Miners, Metallurgists, and Assayers. By Julius Silversmith. New York, D. Van Nostrand, 1866.

La Vie Souterraine, ou es Mines et les Mineurs. Par L. Simonin. Paris, L. Hachette & Cie., 1867.

Reports upon the Mineral Resources of the United States. By Special Commissioners J. Ross Browne and James

W. Taylor. Washington, Government Printing Office, 1867.

A Treatise on Coal and Coal-mining. By Warrington W. Smyth, M.A., F.R.S., &c. London, Virtue, Bros., & Co., 1867.

The Mines of the West; Reports to the Secretary of the United States Treasury, 1867, 1868, and 1869. New York, J. B. Ford & Co., 1867–9.

The Mining and Metallurgy of Gold and Silver. By J. Arthur Phillips. London, E. & F. N. Spon, 1868.

The Gold Fields and Mineral Districts of Victoria. By R. Brough Smyth, F.G.S. Melbourne, J. Ferries; London, Trübner & Co., 1869. (This book has a mining glossary illustrated by woodcuts.)

Practical Mining fully and familiarly described. By George Rickard. London, Effingham Wilson, 1869.

Die Ventilationsmaschinen der Bergwerke, von Julius Ritter von Hauer. Leipzig, Arthur Felix, 1870.

Explosive Nitrilverbindungen, insbesondere Dynamit und Schiesswolle deren Eigenschaften und Verwendung in der Sprengtechnik. Von Isidor Trauzl. Wien, Gerold, 1870.

Papers on the Theory and Practice of Coal Mining. By George Fowler. London, W. M. Hutchings, 1870.

Statistics of Mines and Mining in the States and Territories West of the Rocky Mountains. By Rossiter W. Raymond, U. S. Commissioner of Mining Statistics. Washington, Gov. Printing Office, 1870 to 1873.

Guide au Tunnel du Mont Cenis. Par A. Covino. Turin, Louis Beuf, 1871.

A Practical Treatise on the Gases met with in Coal Mines, and the General Principles of Ventilation. By the late J. J. Atkinson, Government Inspector of Mines for Durham. Newcastle-on-Tyne, Reid, 1871.

Notices of Mining Machinery, and various mechanical appliances in use, chiefly in the Pacific States and Territories for mining, raising, and working ores, with comparative notices of foreign apparatus for similar purposes. By William P. Blake. New Haven, Conn., C. C. Chatfield & Co., 1871.

Manual of Mining Tools. With Atlas of Plates. By W. *Morgans.* London, Lockwood & Co., 1871.

Practical Observations on the South Wales Coal-field. By W. Fairley. London, Colliery Guardian Office.

Lehrbuch der gesammten Tunnelbaukunst. Von Franz Rziha. 2 vols. Berlin, Ernst & Korn, 1864–72.

Construction der Kolben- und Centrifugalpumpen, Ventilatoren und Exhaustoren. Von C. Fink. Berlin, Rudolph Gaertner, 1872.

Ergänzungsband zum Leitfaden der Bergbaukunde von Lottner-Serlo, nach den neuesten Fortschritten bearbeitet, von Dr. Albert Serlo. Berlin, Julius Springer, 1872.

The Explorers', Miners', and Metallurgists' Companion. By J. S. Phillips, San Francisco, 1873.

PERIODICALS AND TRANSACTIONS OF SOCIETIES.

Note.—The dash after the date of a periodical denotes that it is still in progress.

Allgemeine Berg- und Hüttenmännische Zeitung. Quedlinburg, 1859–63.

American Journal of Mining. New York, 1866–69. *See also* Engineering and Mining Journal.

Anales de Minas. Madrid, 1838–46.

Annales des Mines. Paris, 1816——

Annuaire du Journal des Mines de Russie. St. Pétersbourg, 1835–42.

Archiv für Bergbau und Hüttenwesen. (Karsten.) Breslau and Berlin, 1818–31.

Archiv für Mineralogie, Bergbau, &c.] (Karsten and Dechen), Berlin, 1829–54.

Berg-Akademie zu Freyberg:
    Bericht vom Bergbau. Leipzig, 1772.

Berggeist. Köln, 1856——

Berg- und Hüttenmännisches Jahrbuch, &c. Wien, 1863.

Berg- und Hüttenmännischer Verein für Kærnten:
    Zeitschrift. Klagenfurt, 1870——

Berg- und Hüttenmännische Zeitung. Freiburg, 1842——

Berg- und Hüttenwesen in Nassau. Wiesbaden, 1865-67.

Corps of Royal Engineers:
    Papers. London, 1837——

Engineering and Mining Journal. New York, 1869—— *See also* American Journal of Mining.

- Ingeniörs Föreningens :
  - Förhandlingar. Stockholm, 1866——
- Institution of Civil Engineers :
  - Transactions. London, 1836–42.
  - Minutes of Proceedings. London, 1837——
- Institution of Engineers of Scotland :
  - Transactions. Glasgow, 1858——
- Institution of Mechanical Engineers :
  - Proceedings. Birmingham, 1847——
- Iron and Steel Institute :
  - Transactions. Newcastle-on-Tyne, 1869-70.
  - Journal. London, 1871——
- Jaarboek van het Mijnwezen in Nederlaandsch Oost-Indië. Amsterdam, 1872——
- Jahrbuch für den Berg- und Hüttenmann. Freiberg, 1870——
- Magazin der Bergbaukunde. Dresden, 1785-99.
- Mining and Smelting Magazine. London, 1862–64.
- Mining Journal. London, 1836——
- Mining Magazine. New York, 1853–56.
- Mining Magazine. London, 1872.
- North of England Institute of Mining Engineers :
  - Transactions. Newcastle, 1852——
- Oberschlesischer Berg- und Hüttenmännischer Verein :
  - Zeitschrift. Breslau, 1862——
- Oesterreichische Zeitschrift für Berg- und Hüttenwesen. Wien, 1853——
- Revista Minera. Madrid, 1850——
- Revue Universelle des Mines. Paris and Liége, 1857——
- Schlesischer Verein für Berg- und Hüttenwesen :
  - Jahrbuch. Breslau, 1859–61.
- School of Mines Records. London, Longmans, 1852–3.
- Société des Ingénieurs Civils :
  - Mémoires et Compte-Rendu. Paris, 1848——
- Society of Engineers :
  - Papers and Transactions. London, 1860——
- South Wales Institute of Engineers :
  - Transactions. Merthyr-Tydfil, 1858——
- Universal Review of Mining. London, 1874.
- Zeitschrift für das Berg- Hütten- und Salinenwesen in dem Preussischen Staate. Berlin, 1858——

Adits and Mines wrought at Liége without the shafts. Phil. Trans. Abr. i. p. 17. 1665.

Some observations made both in Mines and at Sea. Phil. Trans. Abr. i. p. 168. 1667.

On Damps in Mines. F. Jessop. Phil. Trans. Abr. ii. p. 224. 1675.

On Damps in Mines. J. Beaumont. Phil. Trans. Abr. ii., p. 474. 1681.

A Plan for Extracting Damp or Foul Air out of all sorts of Pits and Mines, by an Engine. Phil. Trans. Abr. vi. p. 208. 1726.

On Damps of Mines in Hungary. Phil. Trans. Abr. i. p. 356. 1753.

Description of a Machine for raising ore from Mines. T. Arkwright. Nic. Journ. i. p. 313. 1791.

A description of a new instrument called the Blast Ventilator. J. W. Boswell. Nic. Journ. iv. p. 41. 1801.

Some observations on the Mines of Cornwall and Devon, describing the art of training the Lead, the art and manner of digging the Ore, and the way of dressing and of blowing Tin. Phil. Trans. Abr. i. p. 565.

An account of the success of the improvement in the Art of Blasting, pointed out by Mr. Jessop. T. Harrison. Nic. Journ. xi. p. 236. 1805.

An account of an Improved Machine for Raising Coals, or other articles from mines. G. Gilpin. Nic. Journ. xxi. p. 111. 1808.

Method of Ventilating Mines or Hospitals by extracting the foul air from them. J. Taylor. Nic. Journ. xxix. p. 330. 1811.

On the Ventilation of Mines. J. Watt. Phil. Mag. xlvii. p. 30. 1816.

A plan for Lighting Mines so as to guard against explosion. J. Murray. Trans. Soc. Edinburgh, viii. p. 31. 1847.

On the mode of Working the Bath Freestone. M. J. Randell. Brit. Ass. 1864.

ENCYCLOPÆDIAS AND DICTIONARIES.

An Encyclopædia of Civil Engineering. By Edw. Cresy London, Longman, Brown, Green, and Longmans, 1856.

Encyclopædia Britannica. A. & C. Black, Edinburgh, 8th ed. 1853–60.

Dictionnaire des Arts et Manufactures, de l'Agriculture, des Mines, &c. Publié par M. C. Laboulaye. Paris, Lacroix et Baudry.

Dictionnaire général des Sciences théoriques et appliquées. Par MM. Privat-Deschanel et Focillon. Paris, Delagrave & Cie., 1867.

A Dictionary of Arts and Sciences. By G. Gregory, D.D. London, R. Phillip, 1807.

Encyclopædia Metropolitana. London, R. Fellowes and others, 1845.

The Penny Cyclopædia. London, C. Knight & Co., 1833–1843.

The New American Cyclopædia. New York, Appleton & Co., 1858–63.

Rees' Cyclopædia, or Universal Dictionary of Arts, Sciences, and Literature. London, Longman, Hurst, Rees, Orme, and Brown, 1819.

Ure's Dictionary of Arts, Manufactures, and Mines. Edited by Robert Hunt. London, Longmans, Green & Co. 1867.

Cyclopædia of Useful Arts. Edited by Chas. Tomlinson. London, Virtue & Co., 1866.

INDEX OF SUBJECT MATTER.

[The numbers refer to the pages on which the Abridgments commence. The names printed in *Italic* are those of the persons by whom the inventions have been communicated to the Applicants for Letters Patent.]

Animal and human power for raising and winding :

Stokoe and Newton, 6.
Stokoe, 10.
Budge, 10.
Storey, 12.
Beaumont, 13.
Dunkin, 25.

Beton for tunnels :

Coignet, 157.

Blasting. *See also* **Cartridges for blasting ; Explosive compounds for blasting ; and Fuses for and firing blasting charges :**

Forsyth, 23.
Congreve, 29.
Liebhaber, 48, 65.
Pidding, 67.
Norton, 74, 84.
Smith and Mackenzie, 93.
Brooman (*Murtineddu*), 115.
Fontainemoreau, 122.
Opie, 154.
Luis (*Lepetit*), 164.
Jacob (*Preisenhammer and Weniger*), 185.
Gedge (*Trouillet*), 203.
Lord and Gilbart, 205.
Gay, 217.
Sutherland, 220.
Mitchell, 224.
Evans, 238.
Brooman (*Dumas*), 248.
Gay, 253.
Bernard, 262, 268.

Blocks or clumps and bricks for tunnels, &c. :

Scott, Clarkson, and Tatham, and Mellish, 20.
Percy, 54.
Austin, 82.
Lillie, 170.
Davidge, 179.

Boring rock, &c. *See also* **Coal and stone, &c. cutting machines :**

Moore, 4.
Ryan, 21.
Miller, 21.
Goode (*App.*), 298.
Newton, 43.
Tayler and Smith (*App.*), 304.
Beart, 46.
Mather and Mather, 49.
Clarke, Freeman, and Varley, 52.
Taylor, 55.
Gard, 57.
Clarke and Motley, 59.
Newton, 63.
Kind and De Wendel, 65.
Roberts, 66.
Pidding, 67.
Dixon and Dodson, 68.
Newton, 70.
Perkes, 70.
Pidding, 77.
Newton, 79.
Kaut, 82.
Newton, 85.
Worthington and Allman, 89.
Mather, 92.
Fontainemoreau, 93.
Bartlett, 96.
Brooman, 99.
Tolhausen (*Hans, Loudon, and Ahlstrom*), 101.
Penrice, 106.
Gard, 113.
Colladon, 120.
Bennett, 127.
Hughes, 128.
Newton, 129.
Greenley and Daft, 135.
Erhard (*Chanoit and Catelineau*), 138.
Schrader, 140.
Allison, 141.
Luis, 142.
Schwartzkorf and Philippson, 143.

Boring rock, &c.—*cont.*
Penrice, 144.
Johnson (*Sommeiller*), 146.
Plimsoll, 147.
Allison, 149.
Scott and Scott (*Von Longinoff*), 155.
Hughes (*Kolb*), 162.
Luis (*Lepetit*), 164.
Paton, 167.
Hunter, 169.
Duverge, 171.
Poole, Wright, Hemming, and Searby, 177.
Hemingway, 184.
Simpson, 187.
Barclay, 190.
Treeby, 190.
Newton (*Lisbet*), 191.
Crease, 193.
Harrison and Standley, 193.
Simpson, 201.
Gedge (*Trouillet*), 203.
Brooman (*Leschot*), 204.
Barclay, 205.
Gilchrist, 206.
Clark, 208.
Barclay, 211.
Low, 212.
Munro and Scott, 215.
Gay, 217.
Polgase and Cox, 223.
Mitchell, 224.
Crease, 225.
James, 229.
Newton (*Jacquetainé*), 239.
Tregay, 243.
Maitland, 245.
Westmacott, 245.
Beaumont, 247.
Johnson (*Haupt*), 260.
Bernard, 262.
Low, 265.
Bernard, 268.
Dœring (*Sachs*), 272.
Stevenson (*Berrens*), 277.
Richards (*Abegg*), 279.
Fidler, 282.
Tongue (*James and Condict*), 287.
Dœring, 289.
Routledge and Ommanney, 290.
Haseltine (*Burleigh*), 292.
Jordan and Darlington, 293.

Brakes for winding and raising machinery :
Cameron, 12, 14.
Bodmer, 44.
Green, 47.
Slade (*App.*), 306.
Russum (*App.*), 308.
Barclay, 87.
Griffiths, 103.
Smith, 107.

Brakes for winding, &c.—*cont.*
Hackworth, 109.
Otway, 121.
Robertson, 124.
Baines, 131.
Woodward and Percy, 134.
Westhead and Baines, 136.
Gidlow, 139.
Dutton, Martin, and Phillips, 151.
Libotte, 151.
Dickinson, 169.
Rollinson and Rollinson, 172.
Law, 175.
Westhead, 177.
Wright and Wright, 180.

Brattices for mines. *See also* Doors for mines :
Coats, 103.

Cages, safety :
Booth, 42.
Fourdrinier, 56.
Slade (*App.*), 306.
Marlor, 86.
Barclay, 87.
Smith, 91.
Smith (*Jacquet*), 94.
Bates, 111.
Van Hengel, 111.
Simpson, 113.
Baines (*App.*), 308.
Owen, 117.
Heaton, 125.
Aytoun, 128.
Owen (*App.*), 310.
Baines, 131.
Woodward and Percy, 134.
Aytoun, 134.
Barnes and Loach, 134.
Westhead and Baines, 136.
Ridley, 142.
Bennetts, 147.
Bailey, 149.
Calow, 149.
Libotte, 150.
Evans, 152.
Gedge (*Fontaine*), 153.
Jackson and Thorley, 154.
Timmins, 160.
Wright, 163.
Buxton, 164.
Addenbrooke and Lewis, 166.
Farrell, 168.
Davis, 168.
Perry, 173.
Dodman and Bellhouse, 174.
Lemielle, 175.
Walmsley and Rostron, 176.
Bailey and Bailey (Speed indicator), 182.
Lister and Myers, 186.
Farrimond, 194.

Cages, safety—*cont.*
Carlow, 194.
Hampshire, 196.
Goodman, 197.
Denton and Whitaker, 232.
Lebrun, 235.
Taylor, 255.
Broadbent, 268.
Norris, 269.
Bellhouse, 283.

Cartridges for blasting:
Carbines, 47.
Melville and Callow, 64.
Norton, 74.
Copeland, 111.
Biehler, 166.
Webb, 166.
Austin, 206.
Cunnack, 218, 236.
Evans, 238.
Sutherland and Sutherland, 253.
Reichen, 267.
Rollason, 292.

Chains for mines:
Hawkes (*App.*), 297.
Smith (*App.*), 297.
Horton (*App.*), 300.
Parkes (*App.*), 300.
Spurgin, 37.
Horton and Smith (*App.*), 301.
Cutler (*App.*), 301.
Wright (*App.*), 302.
Haines and Haines (*App.*), 304.
Losh (*App.*), 305.
Parkes (*App.*), 305.
Lucas (*App.*), 306.
Bayliss (*App.*), 306.
Puis, 73.
Bayliss, 109.
Corfield, 146.
Newman, 147.
Webster, 251.

Coal and stone, &c. cutting and wedging machines:
Meinzies, 7.
Walkinshaw, 8.
Miller, 21.
Wood, 32.
Newton, 43.
Clark, Freeman, and Varley, 52.
Bell, 53.
Roberts, 66.
Dixon and Dodson, 68.
Hedley, 69.
Newton, 70.
Waring, 72.
Cottam (hydraulic wedge), 74.

Coal and stone, &c.—*cont.*
Hedley, 75.
Peace, 83.
Chaffer and Ellis, 97.
Johnston and Dixon, 102.
Colladon, 120.
Newton, 133.
Greenley and Daft, 135.
Penrice, 144.
Plimsoll, 147.
St. Just, 158.
Brooman (*Destrem and Valauri*), 170.
Ridley and Rothery, 180.
Donisthorpe, 181.
Penrice, 181.
Hemingway, 184, 188.
Firth and Ridley, 188.
Donisthorpe, Firth, and Ridley, 189.
Jenkins, 206.
Delahaye, 211.
Donisthorpe, 213.
Gray, 214.
Burton, Rhodes, Seanor, and Scruton, 215.
Munro and Scott, 215.
Jones and Ridley, 216.
Firth and Firth, 218.
Ridley and Jones, 220.
Sturgeon, 221.
Locke, Warrington, Carrett, Marshall, and Telford, 225.
Firth, Firth, and Sturgeon, 226.
Donisthorpe, 227.
Philipson and Dees, 227.
Harrison, 228, 229.
Firth, Firth, and Sturgeon, 230.
Bartholomew, 232.
Donisthorpe, 234.
Jones, 235.
Burdon, 236.
Penrice, 236.
Nisbet, 239.
Russell, 240.
Hunter, 241.
Firth and Firth, 241.
Thomson, 243.
Westmacott, 245.
Beaumont, 247.
Armitage, 248.
Burdon, 249.
Taylorson, 250.
Donisthorpe, 252.
Jones, 252.
Gay, 253.
Haggie and Gledhill, 254.
Garrett, Warington, and Sturgeon, 255.
Jones, 256.
Lauder (*Grier and Boyd*), 258.
Farrar and Booth, 259.
Jones, 261.

Coal and stone, &c.—*cont.*
- Leatham, 262.
- Haseltine (*Lindsley*), 264.
- Low, 265.
- Newton (*Wardwell*), 267.
- Alison and Hoskings, 270.
- Donisthorpe, 270.
- Cooke and Hunter, 273.
- Penrice, 274.
- Bartholomew, 274.
- Cooke and Hunter, 275.
- Rothery, 276.
- Donisthorpe, 278.
- Beacher and Gillott, 279.
- Dalby, 279.
- Jones, 280.
- Donisthorpe, 281.
- Nisbet, 281.
- Fidler, 282.
- Brunton, 284.
- Jones, 288.
- Hunter, 289.
- Gledhill, 291.

Coffer dams for mining:
- Shaw, 251.

Communicating in mines:
- Meinzies, 7.
- Myers, Askew and Askew (*App.*), 309.
- Palmer, 104.
- Otway, 121.
- Leak, 237.
- Eckersley, 242.
- Buckley, 273.
- Punshon, 283.

Corves and skips for mines. *See also* Discharging minerals; Winding from mines; Trucks for mines; Raising from mines:
- Jeffreys, 18.
- Slade, 34.
- Cowper, 62.
- Bossau, 161.
- Hei, 250.
- Murray, 268.
- Clark (*Williams*), 286.

Corf bows:
- Hodshon, 4.
- Reed, 35.

Digging pits, wells, &c.:
- Milroy, 283.

Discharging minerals:
- Curr, 13.
- Sladen (*App.*), 296.
- Penneck (*App.*), 298.

Discharging minerals—*cont.*
- Pope, 198.
- Coltman, 201.
- Plevins and Rider, 204.
- Firth and Firth, 218.
- Murray (*Skip*), 268.
- Clark (*Williams*), 286.

Doors for mines:
- Rogers, 97.
- Heaton, 105.
- Forster, 108.
- Boycott, 113.
- Heaton, 125.
- Rennie, 126, 132.
- Barton, 217.

Draining mines, &c.:
- Apparatus not described;
  - Gilbert, 1.
  - Gilbert and Freese, 2.
  - Vivyan, 2.
  - Horsley, Ramsey, Foulke and Dudley (*App.*), 295.
  - Frizell (*App.*), 295.
  - Wemis and Wemis, 3.
  - Buttall, 4.
- By pumps:
  - Crumpe, 1.
  - Parsons, 4.
  - Walkinshaw, 8.
  - Barber, 9, 11.
  - Gullett, 11.
  - Beaumont, 13.
  - Mackworth, 121.
- By "windeing of counter-ballance;
  - Vandicke and Francke, 3.
- By winding apparatus;
  - Stokoe and Newton, 6.
  - Meinzies, 7.
  - Cameron, 12.
- By vacuum;
  - Barber, 9, 11.
  - Kingsley, 127.
- By buckets, tanks, &c.;
  - Slade, 34.
  - Buckingham, 38.
  - Lucas, 77.
  - Goble, 78.
  - Brooman (*Trautmann*), 130.
  - Wright, 155.
- By intercepting gallery;
  - Piaud, 118.
- By raising water by induction;
  - McEwan and Neilson, 266.

Examining tunnels, drifts, &c.:
- Barnes, 260, 268.

Explosive compounds for blasting :
Taylor, 54.
Melville and Callow, 64.
Davy and Chanu, 67.
Bellford, 86.
Davey, 144.
De Trets, 152.
Hughes (*Rave*), 156.
Lobb, 186.
Newton (*Wynants and Esselens*), 196.
Kellow and Short, 200.
Benton (*Ricker*), 207.
Spence (*Ricker*), 213.
Dronke (*Schultze*), 221.
Newton (*Nobel*), 223.
Budenberg (*Schäffer and Budenberg*), 224.
Wigfall and Jolly, 228.
Dronke (*Schultze*), 240.
Ehrhardt, 244.
Newton (*Nobel*), 246.
Cotter, 257.
Klein, 264.
Reichen, 267.
Budenberg (*Schäffer and Budenberg*), 272.
Bleckmann (*Fehleisen and Fehleisen*), 282.
Rollason, 292.
Neumeyer, 293.

Fire-damp, destroying. *See also* Ventilating mines :
Wood, 30.
Addison, 130.
Higgins, 137.

Fire-escape for mines :
Rock, 210.

Fuses for, and firing blasting charges :
Bickford, 33.
Carbines, 47.
Bickford, Smith, and Davey, 50.
Smith, 55.
Loam, 58.
Davey and Chanu, 67.
Norton, 74.
Davey, 95.
Anderson, 128.
Gomez and Mills, 132.
Victor and Polglase, 179.
Davey, 185.
Bickford and Smith, 185.
Victor, Polglase, Rounsevell, 197.
Newton (*Beardslee and Beardslee*), 209.
Hunter, 241.

Fuses, &c.—*cont.*
Brooman (*Dumas*), 248.
Newton (*Walton*), 251.
Sharp and Smith, 282.
Gresham (*Whitehorn*), 289.
Rollason, 292.

Guards and covers for shafts :
Curr, 13.
Jones, 88.
Reid, 119.
Otway, 121.
Heaton, 125.
Cope, 159.
Perry, 173.
Copple and Copple, 184.
Barton, 217.

Hauling in mines :
Cameron, 14.
Jeffreys, 18.
Miller, 21.
Chapman, 24.

Hook apparatus, safety :
Reed, 35.
Knowles, 114.
Barnes (*App.*), 308.
Marland and Widdall, 139.
Bailey, 149.
Calow, 149.
Evans, 152.
Knowles, 156.
Jackson, 158.
Cope, 159.
Timmins, 160.
Walker, 162.
Wright, 163.
Farrell, 168.
Davis, 168.
Perry, 173.
Walmsley, and Rostron, 176.
Copple and Copple, 184.
Lister and Myers, 186.
Carlow, 194.
Hampshire, 196.
Denton and Whitaker, 232.

Indicating eruption of water into mines :
West, 258.

Indicating presence of minerals :
Hoga, 74.
Johnson (*Langlois*), 207.

Indicating quantities of minerals raised :
Yates, 219.

Indicating state of atmosphere in mines :

- Warrick (*App.*), 303.
- Beaumont, 119.
- Addison, 130.
- Gisborne and Wickens, 194.
- Moore, 197.
- Ansell, 259.

Lighting mines, &c.:

- Murray, 46.
- Longbottom, 107.
- Wright, 112.
- Clark, 119.
- Clark (*Serrin*), 150.
- Ribton, 178.
- Morris, Weare, and Monckton, 199.
- Bowditch, 231.
- Brooman (*Dumas*), 248.

Lighting subways :

- Williams (*App.*), 299.
- Bellford, 81.
- Green, 117.
- Baylis, 141 (*App.*), 309.

Lubricating axles of corves :

- Hey, 250.

Picks for miners. *See also* Coal-cutting machines :

- Bell, 53.
- Newton (*WashoeCompany*), 269.
- Dähne and Thomas, 290.

Pit chains. *See* Chains for mines.

Power for mines, &c., motive. *See also* Coal-cutting machinery; *also* Wind power for raising and winding; Animal and human power for raising and winding; Water power for raising and winding :

- Shorland (*App.*), 295.
- Longridge, 110.
- Barsanti and Matteucci, 125.
- Jones, 243, 256.
- Leatham, 262.
- Rothery, 276.
- Stevenson (*Berrens*), 277.
- Dietrich, 285.
- Jordan and Darlington, 293.

Power, transmitting:

- Harsleben, 31.
- Mackworth, 121.

Props for mines. *See* Supports for mines.

Raising by counterbalance :

- Meinzies, 7.
- Oxley, 9.
- Knowles and Holman, 11.
- Hateley, 15.
- Miller, 21.
- Lucas, 77.
- Yule, 88.
- Baines (*App.*), 308.

Raising by endless ropes and flexible ladders :

- Stokoe, 10.
- Storey, 12.
- Sladen (*App.*), 296.
- Jeffreys, 18.
- Slade, 34.
- Spurgin, 36, 37.
- Mackworth, 135.

Raising from mines. *See also* Draining mines; Winding from mines :

- Apparatus not described;
  - Vivyan, 2.
  - Wemis and Wemis, 3.
  - Morton and Weale, 3.
  - Williams, 3.
- By rack and pinions in shaft;
  - Snowden, 30.
  - Fromont, 168.
- By ascending and descending or reciprocating platforms;
  - Slade, 34.
  - Spurgin, 36, 37.
  - Boissau, 161.
- By screwed shaft;
  - Booth, 42.
  - Royds, Roscow, and Lord, 126.
  - Demanet, 137.
  - Bragg and Bridgeman, 242.
- By atmospheric tubes;
  - Newton, 45.
  - Green, 47.
  - Knowles and Woodcock, 50.
  - Bovill and Griffiths, 53.
  - Puis, 57.
  - Brooman (*Trautmann*), 130.
  - Allison and Shaw, 247.
  - Edwards, 255.
- By atmospheric and water pressure;
  - Simpson, 63.
- By long piston rod;
  - Wright, 155.
- By modified man-engine;
  - Cowper, 62.

Raising from mines, &c.—*cont.*
  By platform on "lazy-tong" levers:
    Gedge, (*Philippart*), 265.
  By "elevators:"
    Clark (*Williams*), 286.

Ropes and bands for mines :
  Curr, 16, 17.
  Chapman and Chapman, 23.
  Crawhall, 33.
  Smith and Hood, 36.
  Newall (*App.*), 303.
  Ellis (*App.*), 307.
  Waithman (*App.*), 307.
  Norton, 91.
  Vaughan. Vaughan, & Vaughan, 115.
  Mackworth, 135.
  Robertson, 140.
  Rogers, 145.
  Spill and Spill, 156.
  Sanderson, 207.
  Newton (*Colson*), 219.

Safety hook apparatus. *See* Hook apparatus, safety.

Signalling in mines. *See* Communicating in mines.

Springs for cages. *See also* Cages, safety :
  Baines (*App.*), 308.
  Eaton, 117.
  Otway, 121.
  Barnes and Loach, 134.
  Spencer, 178.
  Johnson and Taylor, 203.

Subaqueous ways. *See also* Tunnels, constructing :
  Hunter, 25.
  Hawkins, 26.
  McCarthy, 26.
  Brunel, 28.
  Cochrane, 31.
  Tayler and Smith (*App.*). 304.
  Franchot and Du Motay, 44.
  Dunn, 61.
  Perkes, 76.
  Bellford, 80.
  Glover, 98.
  Codde, 103.
  Vacherot, 108.
  Folson, 123.
  Bruff, 133.
  Jackson, 137.
  Chalmers, 178.
  Cowan, 186.
  Rees, 193.
  Johnson (*Durand*), 199.

Subaqueous ways—*cont.*
  Doull, 271.
  Morton, 278.

Subways, constructing. *See also* Subaqueous ways ; Tunnels, constructing :
  Williams (*App.*), 299.
  Baylis (*App.*), 309.
  Baylis, 141.
  Dudgeon, Meakin, and Allen, 210.
  Mallet, 214.

Supports for mines :
  Charlton, 19.
  Johnston, 182.
  Elliot, 223.

Trucks for mines. *See* Discharging minerals and Raising and winding from mines :
  Sladen (*App.*), 296.
  Boissan, 161.
  Pope, 198.
  Clark (*Williams*), 286.

Tubbing or lining shafts, wells, &c. :
  Kind and de Wendel, 65.
  Erhard (*Chanoit and Catelineau*), 138.
  Gibson, 223.
  Scott, 280.

Tubes for well-sinking. *See also* Tubbing or lining shafts, wells, &c.:
  Newton (*Messenger, Brewer, and Mudge*), 266.
  Johnson (*Suggett*), 270.
  Davies (*White and Bedford*) (fabric for tubes), 286.

Tunnels, constructing. *See also* Boring rock, &c.; Coal, &c. cutting and working machines ; Subways, constructing ; and Subaqueous ways :
  Shorter, 25.
  Brunel, 28.
  Cochrane, 31.
  Dyar, 32.
  Booth, 37.
  Fraser, 39.
  Pirou, 60.
  Rogers, 75.
  Perkes, 76.

Tunnels, constructing—*cont.*
Bellford, 80.
Bruck, 81.
Curtis, 101.
Treeby, 116.
Baylis (*App.*), 309.
Mennons, 136.
Gilbert, 161.
Biehler, 166.
Tarte and Toovey, 167.
Dudgeon, Meakin, and Allen, 210.
Mallet, 214.
Harrison, 229.
Beaumont, 247.
Feichtinger, 247.
Barlow, 249.
Haseltine (*Lindsley*), 264.
Doull, 271.
Cotterill, 285.

Ventilating mines, &c. *See also* Fire-damp, destroying:
By boring apparatus;
Ryan, 21.
Regulator;
Travis and Casartelli, 123.
Breathing pipes;
Howard, 129.
Wilson, 148.
Flexible tubing;
Lever, 237.
By fan or screw apparatus;
White, 14.
Howden, 24.
Chabannes, 27.
Douglas, 34.
Fourness, 38.
Buckingham, 39.
Ruthven and Ruthven, 41.
Biram, 41.
Booth, 42.
Sunderland, 43.
Crossby, 70.
Perkes, 71.
Weight, 78.
Biram, 79.
Lemielle, 89.
Higgins, 91.
Marsden, 99.
Wadsworth, 105.
Wadsworth, 112.
Piaud, 118.
Penrice, 181.
Hewett, 182.
Guibal, 195.
Rydill, 200.
Ridley and Jones, 203.
Dobb, 219.
Lang, 238.
Johnson (*Haupt*), 260.
Harrison and Harrison, 272.
Sloper, 293.

Ventilating mines, &c.—*cont.*
By furnace;
Raley, 18.
Howden, 24.
Chabannes, 27.
Garsed and Robinson, 33.
Gordon, 60.
Perkes, 71.
Rogers, 85.
Heppell, 122.
Paule, 125.
Lancaster, 148.
Newton (*Stone*), 170.
Williams, 174.
Crestadoro, 200.
Rogers, 244.
Apparatus not described;
Sutton, 5.
Colwell, 174.
By exhausting apparatus, such as bellows, cylinders, &c.;
Parsons, 4.
Howden, 24.
Buckingham, 39.
Payerne, 44.
Struvé, 52.
Richards and Beck, 76.
Jones, 78.
Bakewell, 80.
Bakewell, 100.
Wadsworth, 105.
Wadsworth, 112.
Heppell, 122.
Scriven, 138.
Chapusot and Avril, 140.
Vasserot (*Welter and Bohringer*), 145.
Williams, 164.
Hughes, 173.
Williams, 174.
Nixon, 188.
Arrangement of air passages in mines;
Douglas, 34.
By induction;
Fourness, 38.
Grant, 46.
Tuck, 56.
Delabarre, 94.
Coulson, 95.
Delmas, 127.
Newton (*Colhoun*), 160.
Rydill, 183.
Evans and Griffiths, 212.
Danchell, 244.
Parker, 276.
Aydon and Field, 284.
By atmospheric and other hoisting apparatus;
Newton, 45.
Green, 47.
Bovill and Griffiths, 53.
Marlor, 86.
Heppell, 114.

Ventilating mines, &c.—*cont.*
- Brooman (*Trautmann*), 130.
- Alison and Shaw, 247.
- By chimney shafts;
  - Wilcock, 56.
  - Chowne, 58.
  - Rogers, 90.
  - Heppell, 114.
  - Heppell, 122.
  - Evans and Griffiths, 212.
- Heating the shaft;
  - Low, 92.
  - Longbottom, 107.
  - Lancaster, 148.
- By coal and cutting machinery;
  - Colladon, 120.
  - Johnson (*Haupt*), 280.
- Indicating air supply;
  - Peace, 87.
  - Keightly, 131.
- Supplying air to persons;
  - Pautard (*Rouquayrol*), 171.
  - Henry (*Rouquayrol*), 237.

Water power for raising and winding:
- Barber, 9.
- Oxley, 9.
- Gullett, 10.
- Miller, 21.
- Cowper, 62.
- Simpson, 63.
- Lucas, 77.

Winding drums and pulleys:
- Knowles and Holman, 11.
- Beaumont, 13.
- Hateley, 15.
- Banks, 16.
- Bunting, 17.
- Curr, 17.
- Murray, 20.
- Chapman, 22.
- Curr, 25.
- Pratt (*App.*), 301.
- Puis, 73.
- Levick and Fieldhouse, 84.
- Burrows, 96.
- Walker, 98.
- Robertson, 124.
- Burness, 152.
- Guibal, 155.
- Crawshay, 165.
- Paton, 167.
- Fowler, Burton, and Greig, 172.
- Burrows and Dougan, 191.
- Johnson, 202.
- Johnson and Taylor, 203.
- Newton (*Colson*), 219.
- Gibson, 257.
- Elliot and Coxon, 263.

Winding from mines. *See also* Raising from mines:
- Parsons, 4.
- Perkins, 5.
- Langworthy. 6.
- Stokoe and Newton, 6.
- Oxley, 8.
- Barber, 9.
- Budge, 10.
- Gullett, 10.
- Barber, 11.
- Gullett, 11.
- Cameron, 12.
- Beaumont, 13.
- Cameron, 14.
- Hateley, 15.
- Gibson (working windlass), 19.
- Dunkin, 25.
- Curr, 25.
- Pratt (*App.*), 301.
- Penneck (*App.*), 298.
- Bodmer, 44.
- Higson, 49.
- Palmer, 51.
- Slade (*App.*), 306.
- Biram, 79.
- Barclay, 83, 87.
- Yule, 88.
- Hackworth, 90.
- Walker, 98.
- Vigars, 105.
- Hackworth, 109.
- Burrows, 115.
- Baines (*App.*), 308.
- Otway (platform for skip), 121.
- Robertson, 124.
- Dutton, Martin, and Phillips, 151.
- Paton, 167.
- Law, 175.
- Lemielle, 175.
- Westhead (governor for cage), 177.
- Bailey and Bailey (indicating speed), 182.
- Savory and Savory, 184.
- Deprez, 192.
- Clark, 208.
- Punshon, 209.
- Balmforth and Robson, 233.

Wind power for raising and winding:
- Perkins, 5.
- Langworthy, 6.
- Gullett, 11.
- Hateley, 15.

Working coal mines:
- Read and Howell, 29.

ERRATA.

Page 22, line 15, *for* " pump " *read* "sump."
„ 78, „ 19, *for* "1850" *read* "1853."
„ 89, „ 4, from bottom, *for* "lamina" *read* "laminæ."
„ 250, „ 2, *for* "curves" *read* "corves."
„ 269, „ 3, from bottom, *for* "difts" *read* "lifts."

LONDON:
Printed by GEORGE E. EYRE and WILLIAM SPOTTISWOODE,
Printers to the Queen's most Excellent Majesty.

PATENT OFFICE.

LIST OF WORKS printed by order of THE COMMISSIONERS OF PATENTS FOR INVENTIONS, and sold at the PATENT OFFICE, 25, Southampton Buildings, Chancery Lane, London.

I.

1. SPECIFICATIONS of PATENTS for INVENTIONS, DISCLAIMERS, &c., enrolled under the Old Law, from A.D. 1617 to Oct. 1852, comprised in 13,561 Blue Books, or 691 thick vols. imp. 8vo. Total cost price about 600*l.*
2. SPECIFICATIONS of INVENTIONS, DISCLAIMERS, &c., deposited and filed under the Patent Law Amendment Act from Oct. 1, 1852, to June 30, 1874, comprised in 72,459 Blue Books, or 2,280 thick vols. imp. 8vo. Total cost price, about 2,325*l.*

II.

INDEXES to PATENTS of INVENTION under the Old Law, from A.D. 1617 to October 1852:—

1. CHRONOLOGICAL INDEX. 2 vols. (1554 pages.) Price 30*s.*; by post, 33*s.* 2*d.*
2. ALPHABETICAL INDEX. 1 vol. (647 pages.) Price 20*s.*; by post, 21*s.* 5*d.*
3. SUBJECT-MATTER INDEX. 2 vols. (970 pages.) Second Edition, to which is prefixed a key of Terms and Phrases. 1857. Price 2*l.* 16*s.*; by post, 2*l.* 18*s.* 8*d.*
4. REFERENCE INDEX of PATENTS of INVENTION, pointing out the Office in which each enrolled Specification may be consulted and the Books in which Specifications, Law Proceedings

connected with Inventions, &c. have been noticed. 1 vol. (710 pages.) Second Edition. 1862. Price 30*s.*; by post, 31*s.* 5*d.*

5. APPENDIX to the REFERENCE INDEX, containing abstracts from such of the early Patents and Signet Bills as describe the nature of the Invention. 1 vol. (91 pages.) Price 4*s.*; by post, 4*s.* 6*d.*

INDEXES of APPLICATIONS for PATENTS and PATENTS GRANTED under the Patent Law Amendment Act, 1852.

CHRONOLOGICAL INDEXES :—

For 1852 (Oct. 1—Dec. 31) and 1853. (258 pages.) Price 11*s.*; by post 12*s.*

		s.	*d.*		*s.*	*d.*
1854 (167 pages),	price	6	0;	by post	6	9
1855 (188 „)	„	6	6	„	7	2
1856 (189 „)	„	6	6	„	7	2
1857 (196 „)	„	6	6	„	7	2
1858 (188 „)	„	6	0	„	6	8
1859 (196 „)	„	6	6	„	7	1
1860 (209 „)	„	7	0	„	7	7
1861 (215 „)	„	7	0	„	7	7
1862 (237 „)	„	7	6	„	8	2
1863 (220 „)	„	7	0	„	7	7
1864 (222 „)	„	7	0	„	7	7
1865 (230 „)	„	7	0	„	7	7
1866 (239 „)	„	7	0	„	7	8
1867 (254 „)	„	7	6	„	8	2
1868 (274 „)	„	8	0	„	8	8

(*For continuation see* CHRONOLOGICAL AND DESCRIPTIVE INDEXES.)

ALPHABETICAL INDEXES :—

For 1852 (Oct. 1—Dec. 31) and 1853. (181 pages.) Price 13*s.*; by post 13*s.* 8*d.*

		s.	*d.*		*s.*	*d.*
1854 (119 pages),	price	7	0;	by post	7	7
1855 (129 „)	„	7	6	„	8	1
1856 (143 „)	„	8	0	„	8	7
1857 (153 „)	„	8	0	„	8	8
1858 (143 „)	„	8	0	„	8	7
1859 (188 „)	„	10	0	„	10	7
1860 (203 „)	„	10	6	„	11	1
1861 (222 „)	„	10	6	„	11	2
1862 (240 „)	„	11	6	„	12	2
1863 (218 „)	„	11	0	„	11	8
1864 (220 „)	„	11	0	„	11	8
1865 (236 „)	„	11	6	„	12	2
1866 (243 „)	„	11	6	„	12	2
1867 (258 „)	„	12	0	„	12	8
1868 (291 „)	„	13	0	„	13	10
1869 (272 „)	„	13	0	„	13	9
1870 (242 „)	„	12	0	„	12	8

SUBJECT-MATTER INDEXES:—

For 1852 (Oct. 1—Dec. 31). (132 pages.) Price 9*s.*; by post, 9*s.* 7*d.*

			s.	*d.*		*s.*	*d.*
1853	(291 pages),	price	16	0;	by post	16	11
1854	(311 „)	„	16	6	„	17	6
1855	(311 „)	„	17	0	„	17	11
1856	(335 „)	„	18	6	„	19	7
1857	(367 „)	„	19	6	„	20	8
1858	(360 „)	„	19	6	„	20	6
1859	(381 „)	„	20	0	„	20	11
1860	(405 „)	„	22	0	„	23	0
1861	(442 „)	„	23	0	„	24	1
1862	(465 „)	„	23	0	„	24	1
1863	(432 „)	„	22	0	„	23	0
1864	(446 „)	„	23	0	„	24	1
1865	(474 „)	„	23	0	„	24	1
1866	(465 „)	„	23	0	„	24	4
1867	(508 „)	„	25	0	„	26	2
1868	(632 „)	„	30	0	„	31	5
1869	(587 „)	„	28	0	„	29	2½
1870	(509 „)	„	28	0	„	29	2

DESCRIPTIVE INDEXES (Abridgments of Provisional and Complete Specifications).

For 1867. In the following quarterly parts:—

1. Quarter ending 31st March. (228 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
2. Quarter ending 30th June. (224 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
3. Quarter ending 30th September. (196 pages.) Price 1*s.* 8*d.*; by post, 2*s.*
4. Quarter ending 31st December. (232 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*

For 1868. In the following quarterly parts:—

1. Quarter ending 31st March. (236 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
2. Quarter ending 30th June. (218 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
3. Quarter ending 30th September. (194 pages.) Price 1*s.* 8*d.*; by post, 2*s.*
4. Quarter ending 31st December. (224 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*

CHRONOLOGICAL AND DESCRIPTIVE INDEXES (containing the Abridgments of Provisional and Complete Specifications, with an Alphabetical Index of Names).

For 1869. In the following quarterly parts:

1. Quarter ending 31st March. (226 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
2. Quarter ending 30th June. (234 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
3. Quarter ending 30th September. (200 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
4. Quarter ending 31st December. (212 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*

For 1870. In the following quarterly parts:—

1. Quarter ending 31st March. (222 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
2. Quarter ending 30th June. (218 pages.) Price 1*s.* 8*d.*; by post, 2*s.* 1*d.*
3. Quarter ending 30th September. (168 pages.) Price 1*s.* 8*d.*; by post, 2*s.*
4. Quarter ending 31st December. (182 pages.) Price 1*s.* 8*d.*; by post, 2*s.*

CHRONOLOGICAL AND DESCRIPTIVE INDEXES (containing the Abridgments of Provisional and Complete Specifications), with Indexes of Names and Subject Matter.

For 1871. (792 pages, with 77 pages Indexes of Names and Subject Matter = 869 pages). Price 19*s.*; by post, 20*s.* 9*d.*

For 1872. (876 pages, with 92 pages Indexes of Names and Subject Matter = 968 pages). Price 19*s.*; by post, 20*s.* 11*d.*

For 1873. (928 pages, with 136 pages Alphabetical and Subject-matter Indexes = 1,064 pages). Price 19*s.*; by post, 21*s.*

For 1874. Published on Friday in each week, and forwarded, post free, to Subscribers. Terms 30*s.* per annum. Subscriptions received at the Sale Room of the Patent Office, where also single copies may be obtained at 4*d.* each, except the No. containing the Alphabetical Index for the year and the concluding No. (containing the Subject-matter Index for the year), which will be 2*s.* each. Post Office Orders to be made payable at the Post Office, Holborn, to Mr. Bennet Woodcroft, Clerk to the Commissioners of Patents.

III.

ABRIDGMENTS (in Classes and Chronologically arranged) of SPECIFICATIONS of PATENTED INVENTIONS, from the earliest enrolled to those published under the Act of 1852.

These books are of 12mo. size, and each is limited to inventions of one class only. They are so arranged as to form at once a Chronological, Alphabetical, Subject-matter, and Reference Index to the class to which they relate. Inventors are strongly recommended, before applying for Letters Patent, to consult the classes of Abridgments of Specifications which relate to the subjects of their inventions, and by the aid of these works to select the Specifications they may consider it necessary to examine in order to ascertain if their inventions are new.

The following series of Abridgments do not extend beyond the end of the year 1866. From that date the Abridgments will be found in chronological order in the "Chronological and Descriptive Index" (*see* Section II. of this List of Works). It is intended, however, to publish these Abridgments in classes as soon as the Abridgments of all the Specifications from the earliest period to the end of 1866 have appeared in a classified form. Until that takes place the Inventor (by the aid of the Subject Matter Index for each year) can continue his examination of the Abridgments relating to the subject of his invention in the Chronological and Descriptive Index.

The classes already published are,—

1. Drain Tiles and Pipes, price 4*d.*, by post 5*d.*
2. Sewing and Embroidering, (*2nd edition*), price 1*s.* 6*d.*; by post, 1*s.* 9*d.*
3. Manure, price 4*d.*, by post 5*d.*
4. Preservation of Food, Part I., A.D. 1691-1855, price 4*d.*, by post 5*d.*—Part II., A.D. 1856-1866, price 6*d.*, by post 7*d.*

5. Marine Propulsion, Parts I., II., & III., A.D. 1618–1857, price 1*s*. 10*d*., by post 2*s*. 1*d*.—Part IV., A.D. 1857–1866, price 1*s*. 10*d*., by post 2*s*. 2*d*.
6. Manufacture of Iron and Steel, Parts I., II., & III., A.D. 1621–1857, price 1*s*. 6*d*., by post 1*s*. 8½*d*.—Part IV., A.D. 1857–1865, price 2*s*. 6*d*., by post 2*s*. 8*d*.
7. Aids to Locomotion, price 6*d*., by post 7*d*.
8. Steam Culture, price 8*d*., by post 9½*d*.
9. Watches, Clocks, and other Timekeepers, Part I., A.D. 1661–1856, price 8*d*., by post 9½*d*.—Part II., A.D. 1857–1866, price 8*d*., by post 9½*d*.
10. Fire-arms and other Weapons, Ammunition, and Accoutrements, Part I., A.D. 1588–1858, price 1*s*. 4*d*., by post 1*s*. 7½*d*.—Part II., A.D. 1858–1866, price 2*s*. 2*d*., by post 2*s*. 6*d*.
11. Paper. Manufacture of Paper Pasteboard, and Papier-mâché. Part I., A.D. 1665–1857, price 10*d*., by post 1*s*.—Part II., A.D. 1858–1866 price 3*s*. 8*d*., by post 3*s*. 10½*d*.
12. Paper. Cutting, Folding, and Ornamenting; including Envelopes, Cards, Paper-hangings, &c., price 8*d*., by post 10*d*.
13. Typographic, Lithographic, & Plate Printing. Part I., A.D. 1617–1857, price 2*s*. 8*d*., by post 3*s*. 3*d*.—Part II., A.D. 1858–1861, price 2*s*., by post 2*s*. 6*d*.
14. Bleaching, Dyeing, and Printing Yarns and Fabrics, Part I., A.D. 1617–1857, price 3*s*. 4*d*., by post 4*s*. 1*d*.—Part II., A.D. 1858–1866, price 8*s*. by post 8*s*. 4½*d*.
15. Electricity and Magnetism, their Generation and Applications Part I., A.D. 1766–1857, price 3*s*. 2*d*., by post 3*s*. 11*d*.—Part II., A.D. 1858–1866 (2*nd edition*), price 2*s*. 8*d*., by post 3*s*. 2*d*.
16. Manufacture and Applications of India-rubber, Gutta-percha, &c.; including Air, Fire, and Water-proofing, price 2*s*. 8*d*., by post 3*s*. 4*d*.
17. Production and Applications of Gas, Part I., A.D. 1681–1858, price 2*s*. 4*d*., by post 2*s*. 11*d*.—Part II., A.D. 1859–1866, price 7*s*., by post 7*s*. 4½*d*.
18. Metals and Alloys, price 1*s*. 10*d*., by post 2*s*. 3½*d*.
19. Photography, Part I., A.D. 1839–1859, price 8*d*., by post 10*d*.—Part II., A.D. 1860–1866, (2*nd edition*), price 10*d*., by post 11½*d*.
20. Weaving, Part I., A.D. 1620–1859, price 4*s*., by post 4*s*. 11½*d*.—Part II., A.D. 1860–1866, price 2*s*. 8*d*., by post, 3*s*. 1*d*.
21. Ship Building, Repairing, Sheathing, Launching, &c., Part I., A.D. 1618–1860, price 2*s*. 4*d*., by post 2*s*. 11*d*.—Part II., A.D. 1861–1866, price 2*s*. 6*d*., by post 2*s*. 11*d*.
22. Bricks and Tiles, Part I., A.D. 1619–1860, price 1*s*., by post 1*s*. 3½*d*.—Part II. A.D. 1861–1866, price 8*d*., by post 9½*d*.
23. Plating or Coating Metals with Metals, Part I., A.D. 1637–1860, price 10*d*., by post 1*s*. 0½*d*.—Part II., A.D. 1861–1866 (2*nd edition*), price 6*d*. by post 7*d*.
24. Pottery, Part I., A.D. 1626–1861, price 10*d*., by post 1*s*.—Part II., A.D. 1862–1866, price 6*d*., by post 7*d*.
25. Medicine, Surgery, and Dentistry (2*nd edition*), price 1*s*. 10*d*., by post 2*s*. 1½*d*.
26. Music and Musical Instruments (2*nd edition*), price 1*s*. 10*d*., by post 2*s*. 1½*d*.
27. Oils, Fats, Lubricants, Candles, and Soap (2*nd edition*), price 2*s*. 10*d*. by post 3*s*. 4*d*.
28. Spinning; including the Preparation of Fibrous Materials, and the Doubling of Yarns and Threads, Part I., A.D. 1624–1863, price 24*s*., by post 25*s*. 5*d*.—Part II., A.D. 1864–1866, price 2*s*. by post 2*s*. 4*d*.
29. Lace and other Looped and Netted Fabrics, price 10*s*., by post 10*s*. 8*d*.
30. Preparation and Combustion of Fuel, price 17*s*., by post 17*s*. 9*d*.
31. Raising, Lowering, and Weighing (2*nd edition*) price 3*s*. 8*d*., by post 4*s*. 3½*d*.
32. Hydraulics, (2*nd edition*), price 4*s*. 8*d*., by post 5*s*. 5*d*.
33. Railways (2*nd edition*), price 2*s*. 6*d*., by post 2*s*. 11*d*.
34. Saddlery, Harness, Stable Fittings, &c., price 1*s*., by post 1*s*. 2*d*.
35. Roads and Ways, price 1*s*., by post 1*s*. 2*d*.
36. Bridges, Viaducts, and Aqueducts, price 10*d*., by post 1*s*.
37. Writing Instruments and Materials, price 1*s*. 4*d*., by post 1*s*. 7*d*.
38. Railway Signals and Communicating Apparatus, price 5*s*. 10*d*., by post 6*s*. 1½*d*.
39. Furniture and Upholstery, price 2*s*., by post 2*s*. 4*d*.
40. Acids, Alkalies, Oxides, and Salts, price 3s. 8d., by post 4s. 3d.
41. Aeronautics, price 4*d*., by post 5*d*.
42. Preparation and Use of Tobacco, price 10d., by post 1s.

43. Books, Portfolios, Card-cases, &c., price 10*d.*, by post 1*s.*
44. Lamps, Candlesticks, Chandeliers, and other Illuminating Apparatus, price 2*s.* 6*d.*, by post 2*s.* 10½*d.*
45. Needles and Pins, price 6*d.*, by post 7*d.*
46. Carriages and other Vehicles for Railways, price 5*s.* 6*d.*, by post, 6*s.* 4*d.*
47. Umbrellas, Parasols, and Walking Sticks, price 10*d.*, by post 11½*d.*
48. Sugar, price 1*s.* 10*d.*, by post 2*s.* 1½*d.*
49. Steam Engine, Part I. (in two volumes), A.D. 1618–1859, price 9*s.* 4*d.*, by post 10*s.* 10½*d.*—Part II. (in two volumes), A.D. 1860–1866, price 4*s.* 10*d.*, by post 5*s.* 7*d.*
50. Paints, Colours, and Varnishes, price 1*s.* 10*d.*, by post 2*s.* 1½*d.*
51. Toys, Games, and Exercises, price 1*s.*, by post 1*s.* 2*d.*
52. Ventilation, price 1*s.* 10*d.*, by post 2*s.* 0½*d.*
53. Farriery; including the Medical and Surgical Treatment of Animals, price 1*s.*, by post 1*s.* 1½*d.*
54. Artists' Instruments and Materials, price 10*d.*, by post 1*s.*
55. Skins, Hides, and Leather, price 1*s.* 6*d.*, by post 1*s.* 8½*d.*
56. Preparing and Cutting Cork; Bottling Liquids; Securing and Opening Bottles, &c., price 1*s.* 6*d.*, by post, 1*s.* 9*d.*
57. Brushing and Sweeping, price 1*s.*, by post, 1*s.* 2*d.*
58. Nails, Rivets, Bolts, Screws, Nuts, and Washers, price 1*s.* 8*d.*, by post, 1*s.* 11½*d.*
59. Hinges, Hinge Joints, and Door Springs, price 8*d.*, by post, 9½*d.*
60. Locks, Latches, Bolts, and Similar Fastenings, price 1*s.* 6*d.*, by post, 1*s.* 9*d.*
61. Cooking, Bread-making, and the Preparation of Confectionery, price 1*s.* 10*d.*, by post 2*s.* 1½*d.*.
62. Air, Gas, and other Motive Power Engines, price 1*s.* 10*d.*, by post 2*s.* 1½*d.*
63. Water Closets, Earth Closets, Urinals, &c., price 10*d.*, by post, 1*s.*
64. Safes, Strong Rooms, Tills, and similar Depositories, price 6*d.*, by post, 7*d.*
65. Wearing Apparel. Division I.—Head Coverings, price 1*s.* 4*d.*, by post, 1*s.* 6½*d.*
66. Wearing Apparel. Division II.—Body Coverings (*in course of preparation*).
67. Wearing Apparel. Division III.—Foot Coverings (*in course of preparation*).
68. Wearing Apparel. Division IV.—Dress Fastenings (*in course of preparation*).
69. Anchors, price 6*d.* by post 7*d.*.
70. Metallic Pipes and Tubes, price 1*s.* 8*d.*, by post, 1*s.* 11*d.*
71. Mining, Quarrying, Tunnelling, and Well-sinking, price 1*s.* 4*d.*, by post 1*s.* 6½*d.*

IV.

COMMISSIONERS of PATENTS' JOURNAL, published on the evenings of Tuesday and Friday in each week. Price 2*d.*; by Post, 3*d.* Annual Subscription, including postage, 23*s.* 6*d.*, which may be remitted by Post Office Order, made payable at the Post Office, Holborn, to Mr. Bennet Woodcroft, Clerk to the Commissioners, Patent Office.

Contents of Journal.

1. Applications for Letters Patent.
2. Grants of Provisional Protection for six months.
3. Inventions protected for six months by the deposit of a Complete Specification.
4. Notices to proceed.
5. Patents sealed.
6. Patents extended.
7. Patents cancelled.
8. Patents on which the third year's stamp duty of 50*l.* has been paid.
9. Patents which have become void by non-payment of the stamp duty of 50*l.* before the expiration of the third year.
10. Patents on which the seventh year's stamp duty of 100*l.* has been paid.
11. Patents which have become void by non-payment of the stamp duty of 100*l.* before the expiration of the seventh year.
12. Colonial Patents and Patent Law.
13. Foreign Patents and Patent Law.
14. Weekly price lists of printed Specifications, &c.
15. Official advertisements and notices of interest to Patentees and Inventors generally.

V.

1. PATENT LAW AMENDMENT ACTS (15 & 16 Vict. cap. 83, A.D. 1852; 16 Vict. cap. 5, A.D. 1853; and 16 & 17 Vict. cap. 115, A.D. 1853); together with the RULES and REGULATIONS issued by the Commissioners of Patents for Inventions, and by the Lord Chancellor and the Master of the Rolls, under the Acts 15 & 16 Vict. c. 83, and 16 & 17 Vict. c. 115. Price 6*d.*; by post, 7*d.*

2. APPENDIX to the SPECIFICATIONS of ENGLISH PATENTS for REAPING MACHINES. By B. WOODCROFT, F.R.S. Price 6*s.* 6*d.*; by post, 6*s.* 11*d.*

3. INDEX to ALL INVENTIONS PATENTED in ENGLAND from 1617 to 1854 inclusive, arranged under the greatest number of heads, with parallel references to INVENTIONS and DISCOVERIES described in the scientific works of VARIOUS NATIONS, as classified by Professor Schubarth. By B. WOODCROFT, F.R.S. Price 1*s.*; by post, 1*s.* 1*d.*

   The foreign works thus indexed form a portion of the Library of the Commissioners of Patents, where they may be consulted.

4. EXTENSION of PATENTS to the COLONIES.—Abstract of Replies to the Secretary of State's Circular Despatch of January 2, 1853, on the subject of the Extension of Patents for Inventions to the Colonies. Second Edition, with Revised Table. 1861. Price 2*s.*; by post, 2*s.* 1½*d.*

5. PATENT RIGHTS in the COLONIES.—Abstract of Replies to the Secretary of State's Circular Despatch of July 11, 1856, calling for Information as to the form of the application to be made by persons desirous of obtaining Patent Rights in the Colonies, and the expenses attendant on the Grant of such Patent Rights. Price 2*s.*; by post, 2*s.* 1½*d.*

6. COPY of AMERICAN PATENT, SPECIFICATION, and other DOCUMENTS relating to an invention of "A new and useful "improved method of removing incrustation from boilers," presented by Davis Embree, of Dayton, Ohio, United States of America, to The Government and People of the United Kingdom of Great Britain and Ireland, 21st April 1865. Price 6*d.*; by post, 6½*d.*

7. SUPPLEMENT to the SERIES of LETTERS PATENT and SPECIFICATIONS, from A.D. 1617 to Oct. 1852; consisting for the most part of Reprints of scarce Pamphlets, descriptive of the early patented Inventions comprised in that Series.

CONTENTS.

1. Metallica; or the Treatise of Metallica, briefly comprehending the doctrine of diverse new metallical inventions, &c. By SIMON STURTEVANT. (*Letters Patent, dated 29th February* 1611.) Price 1*s.* 4*d.*; by post, 1*s.* 5*d.*

2. A Treatise of Metallica, but not that which was published by Mr. Simon Sturtevant, upon his Patent, &c. By JOHN ROVENZON. (*Letters Patent granted A.D.* 1612.) Price 4*d.*; by post, 4½*d.*

3. A Commission directed to Sir Richard Wynne and others to inquire upon oath whether NICHOLAS PAGE or Sir NICHOLAS HALSE was the first inventor of certaine kilnes for the drying of malt, &c. &c. (*Letters Patent, Nos.* 33 *and* 85, *respectively dated* 8*th April* 1626, *and* 23*rd July* 1635.) Price 2*d.*; by post, 2½*d.*

4. DUD DUDLEY'S Metallum Martis; or iron made with pit-coale, sea-coale, &c. (*Letters Patent, Nos.* 18 *and* 117, *respectively dated* 22*nd February* 1620, *and* 2*nd May* 1638.) Price 8*d.*; by post, 8½*d.*

5. Description of the nature and working of the Patent Waterscoop Wheels invented by WILLIAM WHELER, as compared with the raising wheels now in common use. By J. B. W. Translated from the Dutch by Dr. Tolhausen. (*Letters Patent, No.* 127, *dated* 24*th June* 1642.) Price 2*s.*; by post, 2*s.* 1½*d.*

6. An exact and true definition of the stupendous Water-commanding Engine invented by the Right Honourable (and deservedly to be praised and admired) EDWARD SOMERSET, Lord Marquis of WORCESTER, &c. &c. (*Stat.* 15 *Car. II. c.* 12. *A.D.* 1663.) Price 4*d.*; by post, 4½*d.*

7. Navigation improved; or the art of rowing ships of all rates in calms with a more easy, swift, and steady motion than oars can. By THOMAS SAVERY. (*Letters Patent, No.* 347, *dated* 10*th January* 1696.) Price 1*s.*; by post, 1*s.* 0½*d.*

8. The Miner's Friend; or an engine to raise water by fire, described, &c. By THOMAS SAVERY. (*Letters Patent, No.* 356, *dated* 25*th July* 1698, *and Stat.* 10 *&* 11 *Will. III. No.* 61, *A.D.* 1699.) Price 1*s.*; by post, 1*s.* 1*d.*

9. Specimina Ichnographica; or a brief narrative of several new inventions and experiments, particularly the navigating a ship in a calm, &c. By JOHN ALLEN, M.D. (*Letters Patent, No.* 513, *dated* 7*th August* 1729.) Price 8*d.*; by post, 9*d.*

10. A description and draught of a new-invented Machine for carrying vessels or ships out of or into any harbour, port, or river against wind and tide, or in a calm, &c. By JONATHAN HULLS. (*Letters Patent, No.* 556, *dated* 21*st December* 1736.) Price 8*d.*; by post, 9*d.*

11. An historical account of a new method for extracting the foul air out of ships, &c., with the description and draught of the machines by which it is performed, &c. By SAMUEL SUTTON, the Inventor. To which are annexed two relations given thereof to the Royal Society by Dr. Mead and Mr. Watson. (*Letters Patent, No.* 602, *dated* 16*th March* 1744.) Price 1*s.*; by post, 1*s.* 1*d.*

12. The letter of Master WILLIAM DRUMMOND for the construction of machines, weapons, and engines of war for attack or defence by land or sea, &c. Dated the 29th September 1626. (*Scotch Patent, temp. Car. II.*) Price 4*d.*; by post, 4½*d.*

13. Contributions to the History of the Steam Engine, being two deeds relating to the erection by Messrs. Boulton and Watt of steam engines on the United Mines at Gwennap, Cornwall, and at Werneth Colliery, near Oldham, Lancashire. From the originals in the Patent Office Library. Price 10*d.*, by post, 10½*d.*

A FREE LIBRARY and READING ROOMS are open to the Public daily, from 10 till 4 o'clock, in the Office of the Commissioners of Patents, 25, Southampton Buildings, Chancery Lane. In addition to the printed Specifications, Indexes, and other publications of the Commissioners, the Library includes a Collection of the leading British and Foreign Scientific Journals, and text-books in the various departments of science and art.

Complete sets of the Commissioners of Patents' publications (*each set including* more than 3,000 volumes and costing for *printing* and paper upwards of £2,900) have been presented to the authorities of the most important towns in the kingdom, on condition that the works shall be rendered daily accessible to the public, for reference or for copying, free of all charge. The following list gives the names of the towns, and shows the place of deposit, so far as ascertained, of each set of the works thus presented:—

Aberdeen (*Mechanics' Institution*).
Belfast (*Queen's College*).
Beverley (*Guildhall*).
Birmingham (*Central Free Library—Reference Department, Ratcliff Place*).
Blackburn (*Free Library and Museum, Town Hall Street*).
Bolton-le-Moors (*Public Library, Exchange Buildings*).
Bradford, Yorkshire (*Borough Accountant's Office, Corporation Buildings, Swain Street*).
Brighton (*Town Hall*).
Bristol (*City Library, King Street*).
Burnley (*Office of the Burnley Improvement Commissioners*).
Bury.
Carlisle (*Public Free Library, Police Office*).
Cork (*Royal Cork Instn, Nelson Place*).
Crewe (*Railway Station*).
Darlington (*Mechanics' Institute, Skinnergate*).
Derby (*Free Public Library*).
Dorchester.
Drogheda.
Dublin (*Royal Dublin Soy, Kildare St.*)
Dundalk (*Free Library*).
Falmouth (*Public Liby, Church St.*).
Gateshead (*Mechanics' Institute*).
Gorton (*Railway Station*).
Glasgow (*Stirling's Liby, Miller St.*).
Grimsby, Great (*Mechanics' Institution, Victoria Street*).
Halifax.
Hertford (*Free Public Library, Town Hall*).
Huddersfield (*Improvement Commissioners' Offices, South Parade*).
Hull (*Mechanics' Inst., George St.*).
Ipswich (*Museum Library, Museum Street*).
Keighley (*Mechanics' Inst., North St.*)
Kidderminster (*Public Free Library, Public Buildings, Vicar Street*).
King's Lynn, Norfolk (*Stanley Library, Athenæum*).
Lancaster (*Mechanics' Institute, Market Street*).
Leamington Priors (*Public Library, Town Hall*).
Leeds (*Public Library, Infirmary Buildings*).
Leicester (*Free Library, Wellington Street*).
Limerick (*Town Hall*).
Liverpool (*Free Public Library, William Brown Street*).
London (*British Museum*).
——— (*Society of Arts, John Street, Adelphi*).
Macclesfield (*Useful Knowledge Society*).
Maidstone (*Free Library*).
Manchester (*Free Liby., Camp Field*).
Montrose (*Free Library*).
Newark, (*Mechanics' Institute, Middle Gate*).
Newcastle-upon-Tyne (*Literary and Philosophical Society*).
Newport, Monmouth (*Commercial Room, Town Hall*).
Northampton.
Norwich (*Free Library, St. John's, Maddermarket*).
Nottingham (*Free Library*).
Oldham (*School of Arts and Sciences, Lyceum*).
Oxford (*Public Free Library, Town Hall*).
Paisley (*Government School of Design, Gilmour Street*).
Plymouth (*Mechanics' Institute, Princess Square*).
Preston, Lancashire (*Dr. Shepherd's Library, the Institution, Avenham*).
Reading (*Literary, Scientific, and Mechanics' Institution, London St.*)
Rochdale (*Free Public Library, Town Hall*).
Rotherham (*Board of Health Offices Howard Street*).
Salford (*Royal Museum and Library, Peel Park*).
Sheffield (*Free Public Library, Surrey Street*).
Southampton (*Hartley Institution*).
Stirling (*Burgh Library, Town House, Broad Street*).
Stockport (*Museum, Vernon Park*).
Sunderland (*Corporation Museum, Athenæum, Fawcett Street*).
Wakefield (*Mechanics' Institution, Barstow Square*).
Warrington (*The Museum and Library*).
Waterford (*Town Hall, The Mall*).
Wexford (*Mechanics' Institute, Crescent Quay*).
Wigan.
Wolverhampton (*Free Library*).
Wolverton (*Railway Station*).
York (*Lower Council Chamber, Guildhall*).

The Commissioners' publications have also been presented to the following Public Offices, Seats of Learning, Societies, British Colonies, and Foreign States :—

Public Offices, &c.

- Admiralty—Chatham Dockyard.
  - Sheerness ditto.
  - Portsmouth ditto.
  - Devonport ditto.
  - Pembroke ditto.
- Artillery Institution, Woolwich.
- Board of Trade, Whitehall.
- Ordnance Office—Pall Mall.
  - Small Arms Factory, Enfield.
- War Office, Pall Mall.
- India Office.
- Royal School of Mines, &c., Jermyn Street, Piccadilly.
- Dublin Castle, Dublin.
- Record and Writ Office, Chancery, Dublin.
- Office of Chancery, Edinburgh.

Seats of Learning and Societies.

- Cambridge University.
- Trinity College, Dublin.
- Queen's College, Galway.
- Incorporated Law Society, Chancery Lane, London.

British Colonies.

- Antigua.
- Barbados.
- British Guiana.
- Canada—Library of Parliament, Ottawa.
  - Bureau of Agriculture, Toronto.
  - Board of Arts and Manufactures, Montreal.
- Cape of Good Hope.
- Ceylon.
- India—Bengal.
  - Bombay.
  - Madras.
  - N.-W. Provinces.
- Jamaica.
- Malta.
- Mauritius.
- New Brunswick.
- Newfoundland.
- New South Wales.
- New Zealand.
- Nova Scotia.
- Prince Edward Island.
- South Australia—Colonial Institute, Adelaide.
- Tasmania.
- Trinidad.
- Victoria—Parliamentary Library, Melbourne.
  - Patent Office, Melbourne.
  - Public Library, Melbourne.

Foreign States.

- Argentine Republic—Buenos Ayres.
- Austria—Athenæum, Vienna.
- Belgium—Ministère de l'Intérieur, Brussels.
  - Musée de l'Industrie, Brussels.
- France—Bibliothèque Nationale, Paris.
  - Conservatoire des Arts et Métiers, Paris.
- Germany—Alsace—Société Industrielle, Mulhouse.
  - Bavaria—Königliche Bibliothek, Munich.
  - Gotha—Ducal Friedenstein Collection.
  - Prussia—Königliche Polytechnische Schule, Aix-la-Chapelle.
    - Gewerbe-Akademie, Berlin.
    - Königliche Bibliothek, Berlin.
    - Königliche Polytechnische Schule, Hanover.
  - Saxony—Polytechnische Schule, Dresden.
  - Wurtemberg—Bibliothek des Musterlagers Stuttgart.
- Italy—Ufficio delle Privative, Rome.
- Netherlands—Harlem.
- Russia—Bibliothèque Impériale, St. Petersburg.
- Spain—Madrid.
- Sweden—Teknologiska Institutet, Stockholm.
- United States—Patent Office, Washington.
  - Astor Library, New York.
  - State Library, Albany.
  - Franklin Institute, Philadelphia.
  - Free Public Library, Boston.
  - Library Company, Philadelphia.
  - Free Public Library, Chicago.
  - Peabody Institute, Baltimore.
  - Historical Society, Madison, Wisconsin.
  - Cornell University, Ithaca, N.Y.
  - Mercantile Library, St. Louis.

Grants of complete series of Abridgments of Specifications have been made to the undermentioned Mechanics' Literary and Scientific Institutions:—

Aberystwith (*Literary and Working Men's Reading Room*).
Alnwick (*Scientific and Mechanical Institution*).
Alton (*Mechanics' Institution*).
Altrincham (*Altrincham and Bowdon Literary Institution*).
Ashby-de-la-Zouch (*Mutual Improvement Society*).
Ashton-under-Lyne, (*Mechanics' Institution*).
Bacup (*Mechanics' Institution*).
Ballymoney (*Town Hall*).
Banbridge (*Literary and Mutual Improvement Society*).
Banbury (*Mechanics' Institution*).
Barnstaple (*Literary and Scientific Institution*).
Bath (*Athenæum*).
——- (*Royal Literary and Scientific Institution*).
Batley (*Mechanics' Institution*).
Battle (*Young Men's Christian Association*).
Belfast (*Athenæum*).
——— (*People's Literary Institute*).
Berkhampstead, Great (*Mechanics' Institute*).
————————— (*Working Men's College*).
Birkenhead (*Literary and Scientific Society*).
Birmingham (*Bloomsbury Institution*).
——————— (*Central Lending Library*).
——————— (*Deritend Working Men's Association*).
——————— (*Free Library and News Room, Gosta Green.*)
——————— (*Graham Street Institution*).
——————— (*Gun Makers' and Inventors' Club*).
——————— (*Law Students' Society.*)
Bodmin (*Literary Institution*).
Bolton (*Mechanics' Institute*).
———(*School of Art*).
Bournemouth (*Library and Reading Room*).
Bradford, Yorkshire (*Church Institute*).
————————— (*Library and Literary Society*).
————————— (*Mechanics' Institute*).
Braintree (*Braintree and Bocking Literary and Mechanics' Institution*).
Brampton, near Chesterfield (*Local Museum and Literary Institute*).
Breage, Cornwall (*Institution*).
Bristol (*Athenæum*).
——— (*Institution*).
——— (*Law Library Society*).
——— (*Library*).
Bromsgrove (*Literary and Mechanics' Institute*).
Burnley (*Literary Institution*).
——— (*Mechanics' Institution*).
Burslem (*Wedgwood Institute*).
Bury (*Athenæum*).
Bury St. Edmund's (*Athenæum*).
——————— (*Mechanics' Institution*).
Calne (*Literary Institution*).
Canterbury (*Working Men's Club*).
Cardigan (*Mechanics' Institute*).
Carharrack (*Literary Institute*).
Carmarthen (*Literary and Scientific Institution*).
Cheddar (*Literary Institution*).
Cheltenham (*Literary and Philosophical Society*).
————— (*Permanent Library*).
————— (*Working Men's Club*).
Chertsey (*Literary and Scientific Institution*).
Chester (*City Library and Reading Room*).
Chesterfield (*Mechanics' Institution*).
Chichester (*Literary and Philosophical Society*).
————— (*Literary Society and Mechanics' Institute*).
Chippenham (*Literary and Scientific Institution*).
Christchurch (*Working Man's Institute*).
Clevedon (*Village Hall Institution for Working Men*).
Cockermouth (*Mechanics' Institution*).
Coggeshall (*Literary and Mechanics' Institution*).
Colchester (*Literary Institution*).
———— (*Young Men's Christian Association*).
Compstall (*Athenæum*).
Coventry (*Free Library*).
———— (*Institute*).
———— (*School of Art*).
Crediton (*Working Men's Club*).
Crewe (*Mechanics' Institution*).
Dartmouth (*Mutual Improvement Society*).
Deal (*Deal and Walmer Institute*).
Denton (*Denton and Haughton Mechanics' Institution*).
Derby (*Mechanics' Institution*).
Devonport (*Mechanics' Institute*).
Dewsbury (*Mechanics' Institution*).
Diss (*Reading Room and Library*).
Doncaster (*Free Library*).
————— (*Great Northern Mechanics' Institute*).
Dorchester (*County Museum and Library*).
—————(*Working Men's Institute*).
Dudley (*Mechanics' Institution*).
Dukinfield (*Village Library and Reading Room*).
Dumbarton (Philosophical and Literary Society).
Dumfries (Mechanics' Institution).

Dundee (*Young Men's Christian Association and Literary Institution*).
Durham (*Mechanics' Institute*).
Eagley, Bolton-le-Moors (*Library and Institute*).
Ealing (*Mechanics' Institute*).
Earlestown, Newton-le-Willows (*Mutual Improvement Society*).
Ebbw Vale (*Literary and Scientific Institute*).
Edinburgh (*Philosophical Institution*).
—— (*Royal Scottish Society of Arts*).
—— (*Subscription Library*).
—— (*Watt Institution and School of Art*).
—— (*Working Men's Club*).
Egham (*Literary Institute*).
Egremont (*Mechanics' Institute*).
—— (*Workmen's Institute*).
Exeter (*Devon and Exeter Albert Memorial Museum, School of Science and Art, and Free Library*).
—— (*Devon and Exeter Institution*).
Farnham (*Young Men's Association*).
Faversham (*Institute*).
Frome (*Literary and Scientific Institution*).
—— (*Mechanics' Institution*).
Gainsborough (*Literary, Scientific and Mechanics' Institute*).
Garforth, near Leeds (*Working Men's Club*).
Glasgow (*Athenæum*).
—— (*Central Working Men's Club and Institute*).
—— (*Institution of Engineers in Scotland*).
—— (*Mechanics' Institution, Bath Street*).
—— (*Philosophical Society*).
Glastonbury (*Literary Institute*).
Godmanchester (*Working Men's Reading Room*).
Gosport (*Gosport and Alverstoke Literary and Scientific Institution*).
Grantham (*Public Literary Institution*).
Gravesend (*Gravesend and Milton Library and Reading Rooms*).
Greenwich (*Working Men's Institute*).
Guernsey (*Mechanics' Institution and Literary Society*).
—— (*Working Men's Association*).
Guildford (*Mechanics' Institute*).
—— (*Working Men's Institution*).
Hadleigh (*Young Men's Institute*).
Halesworth (*Mechanics' Institute*).
Halifax (*Literary and Philosophical Society*).
—— (*Mechanics' Institute*).
—— (*Working Men's College*).
Halstead (*Literary and Mechanics' Institute*).
Haslingdon (*Institute*).
Hastings (*Literary and Scientific Institute*).
—— (*Mechanics' Institution*).
Hawarden (*Literary Institution*).
Hebden Bridge, near Todmorden (*Mechanics' Institution*).
Helston (*Reading Room and Library*).
Hemel Hempsted (*Mechanics' Institute*).
Hereford (*Natural History, Philosophical, Antiquarian, and Literary Society*).
Hertford (*Literary and Scientific Institution*).
Heywood (*Mechanics' Institute*).
Hitchin (*Mechanics' Institute*).
Holbeck (*Mechanics' Institution*).
Hollingwood (*Working Men's Club*).
Holt, Norfolk (*Literary Society*).
Holywell Green (*Mechanics' Institution*).
Horncastle (*Mechanics' Institution*).
Huddersfield (*Mechanics' Institution*)
Hull (*Church Institute*).
—— (*Literary, Scientific, and Mechanics' Institute*).
—— (*Lyceum Library*).
—— (*Royal Institution, Albion Street*).
—— (*Young People's Institute*).
Huntingdon (*Literary and Scientific Institution*).
Inverness (*Working Men's Club*).
Ipswich (*Working Men's College*).
Kendal (*Christian and Literary Institute*).
—— (*Mechanics' Institute*).
—— (*Working Men's Institute*).
Kidderminster (*Mechanics' Institute*).
Lancaster (*Mechanics' Institute and School of Science*).
Lee, Kent (*Working Men's Institution*).
Leeds (*Chapeltown Branch Library*).
—— (*Church Institute*).
—— (*Holbeck Branch Library*).
—— (*Hunslet Branch Library*).
—— (*Leeds Library*).
—— (*Mechanics' Institution and Literary Society*).
—— (*Philosophical and Literary Society*).
—— (*Working Men's Institute*).
—— (*Young Men's Christian Association*).
Leek, Staffordshire (*Literary and Mechanics' Institution*).
Leicester (*Law Society*).
—— (*Young Men's Christian Association*).
Leighton Buzzard (*Working Men's Mutual Improvement Society*).
Leith (*Mechanics' Subscription Library*).
Lewes (*Fitzroy Memorial Library*).
—— (*Mechanics' Institute*).
—— (*School of Science and Art*).
Lincoln (*Mechanics' Institute*).
Liverpool (*Institute*).
—— (*Mechanics' Institute*).
—— (*Medical Institution*).
—— (*Polytechnic Society*).
Llanelly (*Chamber of Commerce and* Reading Room).
Lockwood (Mechanics' Institution).

London (*Albert Working Men's Club, Knightsbridge*).
——— (*Bank of England Library and Literary Association*).
——— (*Beaumont Institute, Mile End*).
——— (*Bedford Working Men's Institute, Spitalfields*).
——— (*Birkbeck Institution, Southampton Buildings, Chancery Lane*).
——— (*Bow and Bromley Road Institute, Bow Road*).
——— (*Bow Common Working Men's Club, Devon's Road, Bow Common*).
——— (*Christchurch Working Men's Club, New Street Lark Hall Lane, Clapham*).
——— (*Clerkenwell Club, Lower Rosoman Street*).
——— (*Holloway Working Men's Club and Institute, Holloway Road*).
——— (*Literary and Scientific Institution, Walworth*).
——— (*London Association of Foremen Engineers and Draughtsmen*).
——— (*St. James and Soho Working Men's Club, Rupert Street, Soho*).
——— (*St. Mary Charterhouse Working Men's Club, Golden Lane*).
——— (*South London Working Men's College, Blackfriars Road*).
——— (*Southwark Working Men's Club, Broadwall, Stamford Street*).
——— (*Working Men's Club, Brixton Hill*).
——— (*Working Men's Club, St. Mark's, Victoria Docks*).
——— (*Working Men's Club and Institute, Battersea*).
——— (*Working Men's Club and Institute Union, Strand*).
——— (*Working Men's Club, Triangle, Hackney*).
——— (*Working Men's College, Great Ormond Street*).
Lowestoft (*Library and Reading Room*).
Lye (*Institution*).
Lymington (*Literary Institute*).
Madeley, Shropshire (*Anstice Memorial, Workmen's Club and Institute*).
Maidstone (*St. Paul's Literary Institute*).
——— *Working Men's Club and Institute*.)
Maldon, Essex (*Literary and Mechanics' Institute*).
Manchester (*Ancoats Branch Free Library*).
——— (*Athenæum*).
——— (*Campfield Free Lending Library*).
——— (*Cheetham Branch Library*).
——— (*Chorlton and Ardwick Branch Free Library*).
——— (*Hulme Branch Free Library*).
——— (*Law Library*).
——— (*Mechanics' Institution*).
Manchester (*Natural History Museum, Peter Street*).
——— (*Owen's College*).
——— (*Portico Library, Mosley Street*).
——— (*Rochdale Road Branch Free Library*).
——— (*Royal Exchange Library*).
——— (*Scientific and Mechanical Society*)
Mansfield (*Co-operative Industrial Society*).
——— (*Mechanics', Artizans', and Apprentices' Library*).
——— (*Mechanics' Institute*).
Marlborough (*Reading and Mutual Improvement Society*).
——— (*Working Men's Hall*).
Melksham (*Mutual Improvement Society*).
Melton Mowbray (*Literary Institute*).
Mere, near Bath (*Literary Association*).
Merthyr-Tydfil (*South Wales Institute of Engineers*).
Middlesborough (*Iron and Steel Institute*).
——— (*Mechanics' Institution*).
Middlewich (*Literary and Scientific Institution*).
Modbury (*Mechanics' Institution*).
Mossley (*Mechanics' Institute*).
Needham Market (*Literary Association*).
Newark (*Mechanics' Institute*).
Newbury (*Literary and Scientific Institution*).
Newcastle-upon-Tyne (*Mechanics' Institution*).
——— (*Working Men's Club*).
New Mills, near Stockport (*Mechanics' Institute*).
Newport, Isle of Wight (*Young Men's Society and Reading Room*).
Northampton (*Mechanics' Institute*).
Nottingham (*Free Library*).
——— (*Mechanics' Institution*).
——— (*Subscription Library, Bromley House*).
Odiham (*Mechanics' Institution*).
Oldham (*Analytic Literary Institution*).
——— (*Mechanics' Institution, Werneth*).
Ormskirk (*Public Library*).
Oswestry (*Institute*).
Over, Cheshire (*Working Men's Institute*).
Oxford (*North Oxford Working Men's Club*).
Patricroft (*Mechanics' Institution*).
Pembroke Dock (*Mechanics' Institute*).
Pendleton (*Mechanics' Institution*).
Penryn (*Working Men's Club and Reading Room*).
Perth (*Mechanics' Library, High Street*).

Peterborough (*Mechanics' Institution*).
Plymouth (*Working Men's Institute*).
Poole (*Literary and Scientific Institution*).
—— (*Mechanics' Institute*).
Portsea Island (*Young Men's Christian Association*).
Preston (*Institution for the Diffusion of Knowledge*).
Reigate (*Mechanics' Institution*).
Retford (*Literary and Mutual Improvement Society*).
Richmond (*Working Men's College*).
Rotherham (*Rotherham and Masbro' Literary and Mechanics' Institute*).
Royston (*Institute*).
Ryde, Isle of Wight (*Philosophical and Scientific Society*).
—— (*Young Men's Christian Association and Literary Institute*).
Saffron Walden (*Literary and Scientific Institution*).
St. Just (*Institution*).
St. Leonard's (*Mechanics' Institution*).
Salford (*Working Men's Club*).
Salisbury (*Literary and Scientific Institution*).
Saltaire (*Literary Institute*).
Selby (*Mechanics' Institute*).
Sevenoaks (*Literary and Scientific Institution*).
Shaftesbury (*Literary Institution*).
Sheerness (*Literary Institute*).
Sheffield (*Branch Free Library*).
—— (*Brightside Branch Library*).
—— (*Literary and Philosophical Society, School of Arts*).
—— (*Mechanics' Institution*).
Shepton Mallet (*Reading and Mutual Improvement Society*).
Sidmouth (*Mechanics' Hall*).
Skipton, Yorkshire (*Mechanics' Institute*).
Slough (*Mechanics' Institute*).
Smethwick, Staffordshire (*Library, Reading Room, and Literary Institute*).
Southampton (*Polytechnic Institution*).
—— (*Workmen's Hall*).
Southport (*Athenæum*).
South Shields (*Public Free Library*).
—— (*Working Men's Institute and Club*).
Southwell (*Literary Institution*).
Spalding (*Mechanics' Institute*).
—— (*Christian Young Men's Association*).
Stafford (*Mechanics' Institute*).
Staines (*Literary and Scientific Institution*).
—— (*Mechanics' Institute and Reading Room*).
Stalybridge, Cheshire (*Mechanics' Institution*).
Stamford (*Institution*).
Stourbridge (*Associated Institute*).
—— (*Church of England Association*)
Stourbridge (*Iron Works Reading Room and Library*).
—— (*Mechanics' Institution*).
—— (*Working Men's Institute*).
Stowmarket (*Literary Institution*).
Stratford (*Working Men's Hall*).
Sudbury, Suffolk (*Literary and Mechanics' Institute*).
Sunderland (*Working Men's Club*).
Swansea (*Royal Institution of South Wales*).
—— (*Working Man's Institute*).
Tavistock (*Mechanics' Institute*).
—— (*Public Library*).
Thornton, near Bradford (*Mechanics' Institute*).
Thornton Heath, Croydon (*Workmen's Club*).
Todmorden (*Mechanics' Institution.*)
Truro (*Cornwall County Library*).
—— (*Institution*).
—— (*Royal Institution of Cornwall*).
Tunbridge (*Literary and Scientific Institute*).
—— (*Mechanics' Institute.*)
Tunbridge Wells (*Mechanics' Institution*).
—— (*Society of Literature and Science*).
Turton, near Bolton (*Chapel Town Institute*).
Tynemouth (*Free Public Library*).
Ulverston (*Temperance Hall*).
Uttoxeter (*Mechanics' Literary Institute*).
Uxbridge (*Uxbridge and Hillingdon, Reading and Newsroom Institute*).
Wakefield (*Mechanics' Institute*).
Wallingford (*Free Library and Literary Institute*).
Walsall (*Free Library*).
Walsham-le-Willows, Suffolk (*Institute*).
Ware (*Institute*).
Warminster (*Athenæum*).
Watford (*Literary Institute*).
Wells, Somerset (*Mechanics' Institution, Grove Lane*).
—— (*Young Men's Society*).
Whaleybridge (*Mechanics' Institute*).
Whitby (*Institute*).
—— (*Museum*).
—— (*Subscription Library*).
Whitehaven (*Mechanics' Institute*).
—— (*Working Men's Reading Room*).
Whitstable (*Institute*).
Wilton (*Literary Institute*).
Winchester (*Mechanics' Institution*).
—— (*Training College*).
Wirksworth (*Mechanics' Institution*).
Wisbeach (*Mechanics' Institute*).
Witham (*Literary Institution*).
Witney (*Athenæum*).
Wolverhampton (*Law Library*).
—— (*Library*).
Wolverton (*Institute*).

Woodbridge (*Literary and Mechanics' Institute*).
——— (*Working Men's Hall*).
Worcester (*Railway Literary Institute*).
——— (*Workman's Hall*).
Yarmouth, Great (*Parochial Library and Museum*).
Yeovil (*Mutual Improvement Society*).
York (*Church Institute*).
——— (*Institute of Popular Science &c.*)
——— (*North Eastern Railway Library and Reading Room.*)

Presentations of portions of the Works, published by order of the Commissioners of Patents, have been made to the following Libraries:—

Armagh (*Town Clerk's Office*).
Aylesbury (*Mechanics' Institution and Literary Society, Kingsbury*).
Birmingham (*Institution of Mechanical Engineers, Newhall Street*).
Boston, Lincolnshire (*Public Offices, Market Place*).
Cambridge (*Free Library, Jesus Lane*).
Cardiff (*Free Library and Museum*).
Chester (*Mechanics' Institute, St. John Street*)
Coalbrookdale (*Literary and Scientific Institution*).
Coventry (*Watchmakers' Association*).
Darwen, Over (*Free Public Library*).
Dublin (*Dublin Library, D'Olier Street*).
Edinburgh (*Horological Society*).
Ennis (*Public Library*).
Gloucester (*Working Men's Institute, Southgate Street*).
Guernsey (*Public Record Office*).
Ipswich (*Mechanics' Institute, Tavern Street*).
Kew (*Library of the Royal Gardens*).
Kington, Herefordshire (*Reading Institute*).
Leominster (*Literary Institute*).
London (*House of Lords*).
——— (*House of Commons*).
London (*Hon. Soc. of Gray's Inn*).
——— („ „ *Inner Temple*
——— („ „ *Lincoln's Inn*).
——— („ „ *Middle Temple*)
——— (*Aeronautical Society*).
——— (*Athenæum Club, Pall Mall*).
——— (*British Horological Institute*).
——— (*General Post Office*).
——— (*Institution of Civil Engineers*).
——— (*Odontological Society*).
——— (*Royal Society*).
——— (*United Service Museum*).
Manchester (*Literary and Philosophical Society, George Street*).
——— (*Mechanics' Institution David Street*).
Newcastle-upon-Tyne (*North of England Institute of Mining Engineers*).
Oxford (*Bodleian Library*).
Stretford, near Manchester (*Mechanics' Institute*).
Swindon, New (*Mechanics' Institute*).
Tamworth (*Library and Reading Room, George Street*).
Yarmouth, Norfolk (*Public Library, South Quay*).

British Colonies and Foreign States.

British Columbia—Mechanics' Institute, Victoria.
——— Public Library, New Westminster.
France—Academy of Science, Paris.
Germany — Kaiserliche Universitäts und Landes-Bibliothek, Strasburg.
Netherlands—Bibliothéque de l'Ecole Polytechnique de Delft.
Russia—Imperial Technological Institute, St. Petersburg.
Turkey—Literary and Scientific Institute, Smyrna.
United States—American Academy of Arts and Sciences, Boston.
——— American Institute, New York.
United States.—American Society of Civil Engineers, New York.
———Industrial University Champaign, Illinois.
——— Mechanics' Institute, San Francisco.
——— Mercantile Library Association, Pittsburgh, Pennsylvania.
——— Odd Fellows' Library Association, San Francisco.
——— Smithsonian Institute, Washington.
——— Wabash College, Crawfordsville, Indiana.
——— Young Men's Christian Association, Scranton, Pennsylvania.

PATENT OFFICE MUSEUM, SOUTH KENSINGTON.

This Museum is open to the public daily, free of charge. The hours of admission are as follows:—

Mondays, Tuesdays, and Saturdays, 10 A.M. till 10 P.M.

Wednesdays, Thursdays, and Fridays, from 10 A.M. till 4, 5, or 6 P.M., according to the season.

If any Patentee should be desirous of exhibiting a model of his invention in London, he may avail himself of this Museum, which has been visited since its opening on the 22nd June 1857 by more than 3,384,000 persons. The model will be received either as a gift or loan; if deposited as a loan, it will be returned on demand. Before sending a model it is requested that the size and description of it shall first be given to the Superintendent of the Patent Office Museum.

GALLERY OF PORTRAITS OF INVENTORS, DISCOVERERS, AND INTRODUCERS OF USEFUL ARTS.—This Collection, formed by Mr. Woodcroft, and first opened to public view in 1853, is now exhibited in the Patent Office.

Presentations or loans of Portraits Medallions, Busts, and Statues, in augmentation of the Collection, are solicited. They will be duly acknowledged in the Commissioners of Patents' Journal, and included in the next edition of the Catalogue.

All communications relating to the Patent Office, or to the Museum and Portrait Gallery, to be addressed to B. Woodcroft, Clerk to the Commissioners of Patents and Superintendent of the Patent Office Museum, at the Patent Office, 25, Southampton Buildings, Chancery Lane, London, W.C.

LONDON:
Printed by George E. Eyre and William Spottiswoode,
Printers to the Queen's most Excellent Majesty.

November, 1874.